LISTEN TO THE WORLD

Short wave radio is by far the fastest and most convenient type of communications for spreading the news about what is going on in the world. And for this reason TRIO's R-300 is the right rig for those who'd like to listen to a live report of the Indianapolis Grand Prix, to Radio Peking or to follow the progress of a Himalayan expedition. The R-300 is the invisible bridge to other countries and continents and the bridge to the home country for many journalists, engineers and technical representatives working abroad. They all want a reliable and sturdy multiband receiver for home use and travel, a receiver working from mains voltage or batteries. And just such a receiver is TRIO's new R-300.

Six Wavebands—LW (170-410 kHz), BC (525-1250 kHz), 4 x SW (160-10m). The four shortwave bands continuously cover the frequency range from 1.25-30 MHz with separate calibration for the commercial (75-11m.) and radio amateur bands (80-10m.) of the large drum-type main tuning and bandspread dials.

Outstanding Input Sensitivity—The dual-gate MOSFET front end assures excellent cross-modulation and spurious characteristics, as well as high input sensitivity. Between 18 and 30 MHz the R-300 operates as a double superhet, giving sensitivity of 1 µV for AM and 0.5 µV for SSB. For full details, contact the sole importers of the exciting TRIO range.

New. CL22 antenna coupler for all shortwave receivers. Perk up your receiver performance the easy way.

Sole Importers: LOWE ELECTRONICS
Cavendish Road, Matlock, Derbyshire
Tel.: Matlock 2817 or 2430
The TS520 System
TRIO have now completed the first stage of the total system concept for amateur radio equipment. With the TS520 and its associated accessories, the amateur radio operator can assemble a station to suit any or all requirements for his hobby enjoyment. All modes and all bands, fixed and mobile/portable are provided by the TS520 system.

SSB/CW Transceiver TS-520
A real "compact"; powerful, rugged and reliable. It has everything which otherwise is available only as an accessory at extra cost; built-in power supply for fixed-station use, transistorized DC/AC power converter for mobile operation, loudspeaker, fixed-channel provisions, VOX control, etc. All these are the TS-520's special features in short format:

Versatile Transmit- and Receive Operations—USB, LSB and CW on all radio amateur bands from 80m. to 10m., and—with the aid of the 2m.-Transverter TV-502—also on the VHF-band from 144 to 146 MHz, as well as fixed frequency operation on four channels. The TS-520 also allows reception of WWV stations on 10 MHz for dial calibration. By adding the External VFO-520 (optional) the TS-520 demonstrates utmost versatility: independent RX- and TX operation with different frequencies transceive operation with slightly variable RX frequency by means of the built-in RT circuit (Receiver Incremental Tuning) plus fixed channel operation totaling nine different combinations.

Advanced Circuitry—With the exception of the transmitter driver and final stage which are equipped with blower-cooled vacuum valves of type 12BY7A and 2 x 52001 the TS-520 is fully transistorized. The semiconductor complement consists of 44 transistors, 18 FETs, 1 IC and 84 diodes. The reliability and stability of this circuit has been substantiated by numerous contests and during rugged mobile operation.

Outstanding Receive and Transmit Performance—The transmitter section of the TS-520 features separate driver, plate and final tuning, a 2-stage ALC circuit for local and DX operation, thus assuring undistorted clearly legible TX signals even after hours of continuous operation. Provisions for linear amplifiers, such as ALC input, antenna relay switching output, etc., are available and ready for use. Dual-gate MOSFETs are employed in all critical receiver circuits to improve the input sensitivity, cross-modulation response and spurious rejection. An 8-pole SSB crystal filter in the IF amplifier provides exceptional selectivity and stability. An optional 1500Hz CW filter is available as an accessory and can be installed at any time. The switch-selectable time constant of the AGC assures perfect reception of SSB and CW signals.

Precision-type VFO—a feature of all TRIO receivers, transmitters and receivers also contributes to the supreme performance of the TS-520. The VFO is fully encapsulated and is controlled by a meshed-gear dial drive (reduction ratio 4 : 1). Dial accuracy is better than ± 1 kHz, frequency drift will not exceed ± 100Hz per hour. Dial calibration is accomplished by means of a built-in 25 kHz crystal marker oscillator.

Built-in Power Supplies—for fixed station use with 120/240v. AC 50-60Hz line voltage or for mobile operation with 12-13.8v. DC by means of the built-in DC/AC converter.

Loaded with Extra Features: threshold-type RF gain control; semi-break-in circuit with sidetone; VOX/PTT/SMX-control; RIT; TUNE switch; LED function indicators for RIT, VFO and FIX channel operation; WWV receive pushbutton; 4-position fixed channel selector switch; built-in 25kHz crystal marker oscillator; two-stage AGC; multi-function meter; terminals for optional accessories such as: 2m.-Transverter TV-502, External VFO-520, External Speaker SP-520, linear amplifier, headphone, microphone and key.

Sole Importers
LOWE ELECTRONICS
119 Cavendish Road
Matlock, Derbyshire
Tel.: Matlock 2817/2430

TS520 £384 VAT Exc.
The 2m First Family

Where quality is a prime requirement

TR-7200G
The number one rig when 2m gear is considered. Rugged, reliable, and carrying the unmistakable stamp of TRIO quality. Sensitive receiver, powerful in transmitter, 22 watt capability with smooth tuning using the "T".

VFO-30G
External VFO, permitting continuous tuning through the entire 2m band from 144 to 146Mhz in conjunction with the TR-7200G and TR-2200G transceivers. Precision dial drive and high dial accuracy. Built-in 600kHz frequency shift for repeater operation.

NEW—TR-2200GX
The superb follow-up model of the world-famous 2m portables TR-2200 and TR-2200G. Numerous technical improvements, higher output power and more versatility than ever before.

NEW—PB-15 (not shown)
Battery pack, consisting of two rechargeable NiCad units as efficient and economical power source for the TR-2200GX and the 70cm UHF Transceiver TR-3200. Battery charger is part of the standard accessories supplied with both models.

NEW—MB-1A (not shown)
Special mobile mount for the TR-2200GX, TR-2200G and TR-3200. Can easily be installed under the instrument panel of any car and allows mounting and removal of the transceiver within seconds.

NEW—YB-2200GX
2m FM Power Amplifier, especially designed for the TR-2200GX and its predecessors. Delivers a minimum output power of 10 watts RF with an input signal of 1 or 2 watts. Built-in voltage stabilizer and overload protection.

Regardless of where you are: in your QTH, on the road, on vacation, on a hike: you will always find a QSO on the 2m band with TRIO VHF equipment. And no matter on which transmit and receive frequencies other 2m. stations are operating, with TRIO equipment you can always join in, because you'll be qrv on all international fixed-frequency channels—either in simplex or via repeaters.

2m FM Portable Transceiver TR-2200GX
The TRIO TR2200GX is the latest model in the most successful line of 2 metre FM handy portable equipment ever produced. Logical development, aided by suggestions from happy owners has produced the best 2 metre portable available today.

NEW—V8-2200GX
It's the high sensitivity and broad coverage of the TR-2200GX. The through-circuit switch allows routing of the input signal directly to the antenna without amplification.

Supplies
The 2m First
Family

TRIO CORPORATION (MANUFACTURERS)
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TRIO CORPORATION (RETAILERS)

For more information contact:

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Matlock, Derbyshire
Tel: 0629 2817/2430

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119 Cavendish Road
Matlock, Derbyshire
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The through-circuit switch allows routing of the input signal directly to the antenna without amplification.

Elegance, reliability, and economy, plus the distinctive TRIO touch.

TR-7200G

The number one rig when 2m gear is considered. Rugged, reliable, and carrying the unmistakable stamp of TRIO quality. Sensitive receiver, powerful in transmitter, 22 watt capability with smooth tuning using the "T".

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Regardless of where you are: in your QTH, on the road, on vacation, on a hike: you will always find a QSO on the 2m. band with TRIO VHF equipment. And no matter on which transmit and receive frequencies other 2m. stations are operating, with TRIO equipment you can always join in, because you'll be qrv on all international fixed-frequency channels—either in simplex or via repeaters.

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The through-circuit switch allows routing of the input signal directly to the antenna without amplification.

Elegance, reliability, and economy, plus the distinctive TRIO touch.
**LOWE ELECTRONICS**

**RTTY - THE EASY WAY**

Teletypewriter signals are found over the whole radio spectrum. They convey news agency reports usually in English or French, weather information or business messages in plain language or code. RTTY signals are also heard on all the amateur bands including 2 metre satellites and may originate from any country in the world.

In the past, the main drawback in decoding these signals has been the necessity to use a mechanical teleprinter. The accompanying noise, oil and frequent maintenance problems, together with the difficulties in making speed changes to accommodate different standards have tended to put off the dedicated enthusiast.

The advent of solid state devices capable of decoding and displaying the RTTY information in complete silence has opened up a new horizon for the radio amateur and keen SWL. The new TD 224 video converter accepts RTTY information and processes it to produce a composite video signal that can be displayed on a 425 line monitor, or on a standard TV set using an optional UHF modulator. This now means that you can use your TV set and enjoy RTTY signals provided that you have a terminal unit with which we can supply, together with either a 625 line monitor or UHF TV set.

Use the TD224 and find out what they say.

**TD224**

Send now for full details and specifications of the new, exciting TD224.

I am writing this at Christmas, yes, that's how far ahead the adverts have to be prepared perhaps I can be excused for murdering the well known song:

**Jingle bells, jingle bells, jingle all the way.**

Prices are subject to alteration without notice.

**HEAD OFFICE**

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**NR-56 FM RECEIVER**

This remarkable little receiver gives the 2m FM listener everything he wants at a very reasonable price. Excellent sensitivity, stability and selectivity coupled with a built-in VFO and very effective squelch make it the ideal receiver for both the beginner and the keen listener. Although the built-in VFO is more than covers the entire 2m band, crystal control of FM channels offers many advantages (particularly in mobile operation), so crystals, which are ex-stock, may be fitted for the popular and repeater bands. It requires 12V DC operation and is thus an excellent receiver for mounting in the car, boat or caravan as well as for home use.

- **Double filters at 10-7 MHz and 455 kHz.**
- **Dual conversion 10-7 MHz/455 kHz.**
- **Narrow filter fitted for European markets.**
- **FET RF stage for high sensitivity.**
- **Built-in loudspeaker.**
- **Small size 5½" x 6½" x 2½".**

**RAK ANTENNAS**

The range of RAK antennas (yes, I know it should be "antennae") represents the finest value available today. From the comprehensive range, we offer a selection for the amateur and SWL. All hardware is in stainless steel and corrosion proofed alloy. Elements are made from AL48DXN traps, which are fully encapsulated and splashproof.

For the amateur radio operator who needs the ideal set-up, we recommend (and we use) the AL48DXN which gives superb performance on 80 and 40. Use it in conjunction with either a vertical or beam for 20, 15 and 10. You will get 80 metre performance on 80 and 40 metres instead of 40!
AMATEUR ELECTRONICS UK

YOUR FIRST CHOICE FOR YAESU MUSEN

FT-221R
2 METRE TRANSCEIVER

ACCEPTED AS THE FINEST ALL-MODE 2 METRE RIG AVAILABLE

MAIN AGENT

AS FACTORY-APPOINTED MAIN AGENTS WE OFFER YOU—
★ LARGEST SELECTION
★ IMMEDIATE DESPATCH ON STOCK ITEMS
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★ FULL WARRANTY SERVICE
★ EXCELLENT CREDIT TERMS

Sensational ATLAS-210/215X

SOLE UK AGENT FOR

A COUPLE OF STAMPS (NO EnVELOPE) BRINGS THE FT-221R, SWAN OR ATLAS LEAFLET. A POSTAL ORDER OR STAMPS FOR 25 PENCE BRINGS THE LATEST YAESU MUSEN MAIN CATALOGUE TOGETHER WITH OUR CREDIT VOUCHER VALUE £1 FOR USE AGAINST YOUR FUTURE YAESU PURCHASE.

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WE ARE PLEASED TO ANNOUNCE THAT OUR FULL-TIME BRANCH — AMATEUR ELECTRONICS UK-SCOTLAND—IS NOW OPEN AT 287 MAIN STREET, WISHAW, LANARKSHIRE. GORDON McCALLUM, GM3UCI, WILL BE AT YOUR SERVICE DURING NORMAL BUSINESS HOURS AND WILL BE VERY PLEASED TO SHOW YOU THE LATEST PRODUCTS. Tel.: WISHAW 71382.

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from our
NEW LARGE YAESU STOCK
OF ALL MODELS

FREE SECURICOR DELIVERY
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SUPERB AFTER-SALES SERVICE

It pays to deal with "WESTERN"

If you want a general coverage receiver at a modest cost then there's only one answer... The FRG-7. Never mind the fancy specification (and it is very good!), what does it offer that some others don't? Why would I be better off with the FRG-7? The answers are simple:
1. If you want to know what frequency you are on the FRG-7 tells you accurately. (If you buy a receiver with a bandspread and a main tuning dial you only know the frequency accurately if you have the main dial set "Spot on" which is a "chance in a million!").
2. With high sensitivity and a low price what more could you ask!
3. As a bonus it operates on mains, external 12v. D.C. (car, etc.) or its internal batteries (2 x U2 cells extra).

DON'T DELAY... ORDER TO-DAY... FROM "WESTERN"

FANTASTIC FEBRUARY OFFER!! DON'T MISS IT!!

2m. ALL MODE TRANSCEIVERS: Only £299 + VAT

Save up to £85! All you have to do is WRITE (no phone enquiries or part exchange) WITH CHEQUE (£336.37) stating your requirements and we will either accept your order or return cheque. At worst you loose 5 minutes and a stamp! (but you may save up to £85!) All units carry a full 90 day warranty on parts and labour.

YOU'LL REGRET NOT SENDING US YOUR ORDER NOW!

ADD A NEW DIMENSION to your hobby with SSTV

The HAMVISION

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<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>SS-727M</td>
<td>MONITOR</td>
<td>£405.00</td>
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<tr>
<td>SS-727C</td>
<td>CAMERA</td>
<td>£303.75</td>
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</tr>
<tr>
<td>SS-303M</td>
<td>MONITOR</td>
<td>£236.25</td>
</tr>
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is all you require to send and receive SSTV pictures when connected to your SSB transmitter.

(Prices inc. VAT and Carr.)
Radiate....with the DX-33 “Penetrator” for 10-15-20m.
THE FIRST OF A NEW PENETRATING RANGE OF ANTENNAS!

HERE’s THE SPECIFICATION …
☆ 3 elements on each band. ☆ Broadband operation.
☆ Heavy duty 2 kW. rated. ☆ Stainless steel hardware.
☆ Gain up to 8dB. ☆ SWR less than 1:3 : 1

HERE’S ITS PERFORMANCE …
(Report received from a GM3) … “I have erected and tried out the DX ‘Penetrator’ supplied to me.
“I accepted this antenna because I had very good results from the quad supplied by you and as it was from your design I expected good results from a beam of your design.
“I may state that these expected results have been exceeded. I have had contacts with JA 5 & 9, W7 5 & 8, K9 5 & 9, VE 5 & 9. And this is using a Sommerkamp FT250 running as they say barefoot.”

AND NOW LOOK AT THE PRICE !
ONLY £73.12 (inc. VAT/Carr.)
(Price correct at time of going to press but will be increased shortly).

Elevate.... with the Westower .... the stronger one……
☆ STANDARD TYPES, rated at 75 m.p.h. with full head load quoted.
☆ HEAVY DUTY TYPES, rated at 100 m.p.h. (approximately twice as strong as a standard model and even our standard model is about 40% stronger than similar types !)
☆ MODELS FROM 25–119’. All telescope down and tilt-over.
☆ MODELS FOR ALL SOIL CONDITIONS, with/without concrete.
☆ DESIGNED BY CHARTERED ENGINEERS TO BRITISH STANDARDS.
☆ CONSTRUCTED OF HIGH QUALITY SPECIAL ALLOY STEEL. Choose from over 50 different models e.g.:

Standard 58’ type 3S, £270 inc. carr./VAT.
Heavy duty 58’ type 3HD, £378 inc. Carr./VAT.

Former customers please note. We regret that we are no longer able to supply replacement sections and conversion -kits for the 60 m.p.h. rated Versatower system.

Western Electronics (UK) Ltd
HEAD OFFICE (All Mail/Enquiries)
FAIRFIELD ESTATE
LOUTH, LINCS, LN11 0JH
(Tel. Louth (0507) 4955 /6)
INTRODUCE THE LATEST IN FM MOBILES
10 WATTS 22 CHANNELS (15 ALREADY WIRED)
AND YOU NEED NEVER BUY ANOTHER CRYSTAL!!

The IC-240 is the start of a revolution in 2 metre transceivers. It has all the advantages of the highly popular IC-22A, with its easily selected 22 Channel capability, but does it all with a phase locked synthesised system. Hence you can programme it for all 22 channels WITHOUT HAVING TO BUY ANY CRYSTALS. Channels are hand wired using diodes according to clearly described instructions. We supply the UK version with 15 channels already wired in, these being 10 simplex and 5 repeater. Thus there are 7 more frequencies for you to programme at your own whim—ideal for RAYNET and local net use. You can programme for any of the 80 channels at 25 kHz spacing between 144 and 146 MHz.

Duplex (for repeater use) operates by shifting the RECEIVE frequency. This means that by switching to SIMPLEX when using repeater channel you will automatically be listening on the INPUT channel of the repeater without having to wire in special “Reverse Repeater” channels.

The main advantage over other more expensive synthesised rigs is that by not having some 400 selectable channels, at 5 kHz spacing (most of which are redundant as they don’t fit into the UK 25 kHz channel spacing system), you are relieved of multiple knob twiddling to change from one popular channel to another. 22 channels are ample for UK national simplex, repeater and local net channels and these are selected by one knob which is easier, quicker and safer than “trying to open a combination safe while driving.”

As an optional extra, a built-in scanning system will be available which will scan all 22 channels.

The IC-240 has the same excellent FM performance as the well known and highly popular IC-22A. Consider these points which all contribute to providing optimum communication either direct or through the ever-growing number of repeaters in the UK:

- Low noise dual-gate mosfet in the front end of the receiver.
- 5-section helical filter after the front end to provide high rejection of unwanted out-of-hand signals.
- Dual conversion with IFs of 10.7 MHz and 455 kHz for excellent image rejection and selectivity, with filters at each IF frequency.
- Narrow filter giving high rejection of adjacent channel signals 25 kHz away.
- Hard IF limiting using an IC.
- A sensitive, temperature compensated, adjustable squelch circuit with front panel indicator to show when the squelch is open should the gain control be turned back to please the XYL.
- 1.5 Watts of audio from its built-in speaker giving ample volume for copy on the move.
- Line voltages are filtered and regulated for reduction of interference from the dynamo or alternator.
- A full 10W output from a sturdy PA transistor.
- Built-in 1750Hz tune burst for repeater use.
- Automatic FA protection.

The channels already programmed are:

SIMPLEX  S0, S16, S17, S18, S19, S20, S21, S22, S23, S24
REPEATER  R3, R4, R5, R6, R7.

Accessories supplied with the rig:

- Microphone
- Quick release mobile mounting bracket
- Fixing screws
- Spare Fuse
- DC power cord

introductory price
£198 inc. VAT.
ICOM are pleased to introduce their first FM portable and a careful look at the features will soon show how popular it's going to be. You can use it ANYWHERE. Change vehicles, use it in the shack or take it for a walk to the local high spot and you have the high quality FM communication, for which ICOM are so famous, available all the time. The batteries are larger than those of its competitors, thus giving considerably longer life. The 3 watt output and high sensitivity receiver makes it a useful main station set, where it can be operated from an external power supply and a good antenna system. Thus the IC-215 can be a good starting point for the man who has just obtained his licence and wants to get on the air without having to spend too much money.

LOOK AT THE MAIN FEATURES:

Aluminium Die-cast Frame. The IC-215 chassis and main frame are integrated into an aluminium die-casting rendering it light but resistant to vibration or shock. It is well protected against shock to the point where the IC-215 can be a good starting point for the man who has just obtained his licence and wants to get on the air without having to spend too much money.

15 Channels. The unit incorporates 15 channels to select from: 12 by the main channel selector and a further 3 by the function switch. All crystals are plug-in-type HC-25/U and are the same as the crystals used in the popular IC-22A. Being fundamental crystals, they are tunable over a reasonably wide range and a separate trimmer is supplied for each crystal making accurate frequency adjustment possible. This is very important for optimum results with minimum interference.

Dual Power Mode. The output power can be switched to 3W on HI for long distance work or 0.5W on LOW for short distance contacts or working a nearby repeater. Battery consumption is minimised in the LOW power mode.

Dial Illumination. The dial can be illuminated to facilitate night operation. This is controlled by a selector switch on the front panel.

Power Pilot Lamp. If the power voltage falls below the required value a red LED power indicator goes out as an indication that the batteries are almost exhausted or the external power is inadequate.

External Power and Antenna Sockets. Sockets for external power and antenna are provided on the rear.

Discriminator Meter Jack. This feature, already well known from the excellent quality produced by the IC-22A, ensures clear optimum talk power without over deviation. This makes the IC-215 a far better rig for use with repeaters and gives an optimum range, for the power used, on simplex contacts.

ACCESSORIES INCLUDED:

- External Speaker plug
- Discriminator socket plug
- 9 x Dry cells type C (U11)
- Comprehensive English handbook

OPTIONAL EXTRAS:

- C-3PS Power supply which doubles as a holder for the IC-215 and the linear.
- IC-20L 10 watt linear amplifier.
- IC-5M2 Desk type condenser microphone with built-in amplifier.
- Ni-Cad Batteries.
- Charger for charging the Ni-Cads in situ.
- Silicone rubber cable cover.

HIRE PURCHASE TERMS AVAILABLE

See ICOM at your nearest agents by telephoned appointments.

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SCOTLAND—Ian, GM3DOX
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WALES—Tony, GW1JKO
0222 702982

MIDLANDS—Tony, GBAVH
021 329 2305

CHESHIRE—Gordon, G3LEQ
Knutford (0565) 4040

DEVON—Bob, G3 PQH aqtr.

THANET ELECTRONICS
143 Reculver Road, Beltinge, Herne Bay, Kent
(02273) 63859 — 2 lines
Direct Ansafone line 63850
UNIDEN 2020. AC/DC power supplies. CW filter. Noise blanker. Blower. Digital and analogue display give direct readout. 2-6146B in PA 80-10 metres. Receiver is pre-mixed single conversion using phase lock loop oscillator circuit. Separate filters for USB/LSB. Price £495.00

UNIDEN 2030. 144-146 MHz FM Transceiver. 12 channels. 12v. DC operation. 10 watt or 1 watt output. Antenna impedance 50 ohm. Complete with microphone and mounting bracket. Price £178.74

YAESU
FT101E Transceiver
FT200 Transceiver
FT401 Transceiver
FR101S Receiver
FR301D Receiver
FR355D Frequency Counter
FRG7 Receiver
FT221R VHF Transceiver

ATLAS
210X Transceiver
215X Transceiver

PLANET
2ML 2m. Linear Amplifier
TV2A 28/144 MHz Transverter
PS12 12v. DC 3 amp PSU

BARLOW WADLEY
WE ARE PLEASED TO ANNOUNCE WE HAVE BEEN APPOINTED SOLE DISTRIBUTORS FOR THE BARLOW WADLEY RECEIVERS FOR THE MIDLANDS AND NORTH WEST. BAdLOW WADLEY XCR-30 EX-STOCK AT £145 INC. VAT. Complete with FM range. Price £170.00. MK2 Multi-Tuner covering 550 KHz to 30 MHz. £23.00

Mk. 1 MULTI TUNER. Designed and manufactured by us. 50 tunable switched positions for antenna lengths over 5 metres in the 2-30 MHz range. Five different circuits to give an excellent match between your receiver and antenna. Now in use in over 35 countries. Price £17.00. MK2 Multi-Tuner covering 550 KHz to 30 MHz. £23.00

We carry a substantial range of equipment by —

DECCA
G-WHIPS JAYBEAM
MICROWAVE MODULES UNIDEN
OMEGA C.D.R.
TECHNICAL ASSOCIATES DRAKE
BELCOM HY-GAIN
BANTEx SWAN

Send us a large S.A.E. or 10p in stamps and we will forward you all the latest details and prices. All our prices include VAT at the current rate at the time of going to Press. S.A.E. with all general enquiries please. H.P. and Credit facilities. Barclaycard and Access facilities. Trade-ins always welcome. We would be pleased to sell your unwanted equipment on a commission basis.

SECONDHAND EQUIPMENT
Yaesu FT101 Transmitter £300
KW202 Receiver £185.00
Yaesu FR101D Receiver £350.00
Yaesu FR101D Digital Receiver £450
Heathkit SB610 Monitor £75.00
KW202 Receiver £185.00
Barlow Wadley XCR-30 Receiver £100
FV400S VFO £40.00
Yaesu FT101 MK2 Transceiver £300
Yaesu FR101D Receiver £375.00
Eddystone 840c Receiver £65
Heathkit Mohican Receiver £35
Heathkit SB610 Monitor £75
Heathkit RAI Receiver £45

We can supply most items from stock. All equipment is sold from the above premises. We do not supply any agents or agents of agents who work from home in their spare time. All equipment is air tested and carries normal guarantee.
We enter our third year as sole distributors for the S.T.E. range in the U.K. The popularity of this equipment is growing all the time. With the kind help of the Directors of S.T.E. we have managed to keep the prices stable for the past three years. This equipment sells for about 20% in some of the ECC countries and to keep costs to the customer down we have not sold to the trade and therefore you get the benefit of lower prices. The quality of these P.C.B’s are the finest we have ever seen. Following on from the ARAC 102 receiver for 28-30 MHz and 144-146 MHz fully tunable, we now have the ARAC 107 28-30 and 145-145 MHz with AM FM and SSB facilities. The base station AK20 transceiver will be soon supplied with mobile mount and also available in kit form. We also look forward to many new models from S.T.E. in the next year.

Price List (including postage)

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAC 102 Receiver</td>
<td>£100.00</td>
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<tr>
<td>Atal 228 Transmitter</td>
<td>£126.00</td>
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<tr>
<td>ASAP 154 AC PSU with speaker</td>
<td>£35.00</td>
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<tr>
<td>AR10 Receiver Module</td>
<td>£37.50</td>
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<tr>
<td>A1 Audio Amplifier</td>
<td>£6.10</td>
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<tr>
<td>AD4 FM Discriminator</td>
<td>£5.00</td>
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<tr>
<td>AL8 Linear Amplifier</td>
<td>£27.00</td>
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<tr>
<td>AT23 Transmitter</td>
<td>£30.00</td>
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<tr>
<td>AT20 C.C. Receiver</td>
<td>£50.00</td>
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<tr>
<td>AT23 C.C. Transmitter</td>
<td>£36.00</td>
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<tr>
<td>AS 15 Stabilised PSU D.C.</td>
<td>£10.00</td>
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<tr>
<td>AG 10 Tone Generator</td>
<td>£4.50</td>
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<tr>
<td>AC2A Converter 28-30 MHz</td>
<td>£20.00</td>
</tr>
<tr>
<td>AK20 Transceiver Kit</td>
<td>£120.00</td>
</tr>
</tbody>
</table>

ARIO Mosfet receiver. 28-30 MHz Double conversion superhet. RF and amplifiers stages are gate protected mosfets for good sensitivity and low intermodulation. Noise limiter and squelch circuit. AM, SSB and CW reception. 12v. DC.

AT 222. A complete transmitter exciter unit for 144-146 MHz on AM or FM, VFO controlled or fixed channel operation. Complete with microphone pre-amp., speech processor including active audio filter. 1 watt output, FM. 25 watt AM. Output impedance 50-75 ohm adjustable. Frequency deviation 3-10 kHz adjustable.

AR20. 12 channel FM receiver 144-146 MHz. Input impedance 50-75 ohm. AM-FM modes. Sensitivity 0-2uV AF output 3 watts. 12v. DC operation.

AT 223. 12 Channel FM Transmitter. 3 watts. 144-146 MHz. Frequency deviation 3-10 kHz adjustable. 12v. DC operated AF input sensitivity 2mV adjustable to 50 mV.
**DIGITAL II from KYOKUTO**

**CRystals AND CRystal FILTERS from SMC (0.75 pair or f2.00 singles) P&P 20p. VAT 121%**

serviceability and screening). Selective calling socket. 

output of the P.L.L. with superb selectivity provided by a 15 pole (±8 kHz at -6dB± 15 kHz at -70dB) Ceramic filter. For strong handling, and low noise the R.F. mixer, first IF (16.9 MHz) second mixer (and LO) are all FET's. The front end is tuned 

seconds. 

The Digital II offers complete 5 kHz step coverage across 2 metres and now with 

readout comes from 6 seven segment LEDS. 

Required channel for 10 seconds, then unless locked moves on. The bright digital 

144-146 (rx to 149 MHz) from a tiny 6+" x 2" x 74".

**The SMC73 General Coverage Receiver**

The SMC73 is an all Solid State, mains and 12v., communications receiver covering 550 kHz to 30 MHz in four overlapping ranges. Frequency readout is by two illuminated dials tuned by coaxial spun aluminium knobs, the larger for general coverage, the inner for amateur 

band (10-80m.) band spread (set by use of internal 3-5 MHz crystal calibrator).

FET's are employed in the R.F. Amplifier, mixers, VFO and BFO (these latter two stages being fed from independent stabilised supplies) ensuring good sensitivity, stability (electrical and 

mechanical), dynamic range (helped by adjustable RF attenuator), and marked freedom from "pulling of both the local and beat frequency oscillators. An internal loudspeaker (but 

with jacks for 'phones and external speaker), illuminated signal meter, SO239 (UHF) coax socket and binding posts for antenna, switchable envelope (APM) and product detectors (SSB/CW) provision on switch for possible fitting of FM demodulator), are all features of this exciting new low price receiver.

**Microwave Modules Transverters**

**Coax Relays**

Up to : 1kW, 1.5 GHz, 0-3dB loss, 1-2 : 1 VSWR, 
50dB isolation, 50 ohm "N" or "PL" fittings. 
Ex-Stock. E17.50

**Send large (10" X 12") SAE or 15p stamps for free Yaesu catalogue and 22 page Stock/Price/S.H. Lists, etc.**

**PLEASE NOTE THESE PRICES DO NOT INCLUDE VAT (12%) or 8%**

Terms :-Cash with order or credit card holders just 'phone in for, if possible, same day dispatch. Immediate H.P. available for card owners for amounts up to £225. Holders of current U.K. simulators (where references have been provided) can be speedily cleared or normal H.P. at competitive rates is available.
Communications Ltd
AGENTS: ENGLAND, N. IRELAND, SCOTLAND, WALES

YAESS MUSEN
SECURICOR SERVICE
2-YEAR GUARANTEE

WE THINK IT THE BEST NOW IT COSTS LESS!!

FT22IR—£339 (+ VAT)

Thanks to our bulk buying policy, we have beaten inflation and the falling pound saving you £22.50 on LAST YEAR’S price! As an added bonus all new SMC FT22IRs cover 4 MHz and are equipped with 600 kHz and 1.6 MHz shifts.

Yaesu’s state of the art technology brings you a fully modular plug in board construction, multimode, 2m, transceiver that renders over the board “rats nest” wiring obsolete. The 134 MHz phase locked voltage controlled oscillator, combined with automatic varicap tuning of the transmitter and receiver gives you, without resort to preselector, an exceedingly clean transmit signal, and a sensitive receiver without degradation of strong signal handling capabilities.

FT22IR FEATURES

- 144-148 MHz INCLUSIVE COVERAGE MULTI-MODE AH-FM-USB-LSB-CW 234v. AC or 12v. DC WORKING 11" (29) x 5" x 11"
- 2XLB DwAL SPEED SMOOTH VFO DRIVE READOUT TO BETTER THAN 1KHZ
- 44 FIX CHANNELS (4 x 11) (12 MHz)
- FT22IR FEATURES
- SEMI BREAK-IN WITH SIDETONE UNIQUE AUTOMATIC TONE BURST P.T.T. MICROPHONE SUPPLIED FRONT PANEL ADJUSTABLE VOX FRONT PANEL ADJUSTABLE VOX FRONT PANEL MICROPHONE GAIN ALC EXTERNAL PHONO SOCKET 70W DISSIPATION PA DEVICE
- 600 kHz AND 1.6 MHz RPT. SHIFTS "5"/CENTRE ZERO/OUTPUT METER CLARIFIER (I/O WITH RT + TT) 2.4 kHz SSB 12kHz BANDWIDTH ADJUSTABLE SENSITIVE SQUELCH 100 kHz CRYSTAL CALIBRATOR SWITCHABLE NOISE BLANKER

THE FRG7 GENERAL COVERAGE RECEIVER Ex-Stock

The FRG7 is a general coverage solid state receiver with specifications unparalleled in its price range. It uses a Barlow Wadley Triple-mix, drill cancelling loop for continuous, spin-tuned inclusive coverage of 5 to 30 MHz with calibration accuracy better than 5 kHz. Frequency selection is accomplished by setting the RF (preselector and range switch), dialing up the required number of megahertz, then tuning the VFO knob as normal.

The receiver is sensitive (0.5μV for 10dB, S+N/N (SSB)) and stable (within 500Hz for any 30 minutes after warm up) with A.M., SSB and CW modes catered for. A 3 position audio filter, RF attenuator, dial conservation switch, recorder and phone sockets are fitted. It is mains powered, but should the supply fail, or portable operation be required. 8 dry cells are automatically switched in.

A TRIO OF YAESU WINNERS ALL EX-STOCK IN TOTTON

FT301
Top to ten, solid state, transceiver 4 models to choose from, 10 or 100W output, digital or analogue.

FT222
2m, F.M. 23 channels, 12v, D.C.—10W. output clw tone burst, mic, mounting bracket, smart sensitive and selective.

FRIOI
WORLD FAMOUS transceiver, top to ten capability 3 models to choose; 234 and 12v. DC speech processor, etc. Large range of matching accessories available.

For Further Information and FREE Yaesu Catalogue Send S.A.E.

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AGENTS (evenings) (ALL QTHR):
**VERSATOWERS**

The telescopic, 20ft. section, with full tilt over facility permits easy antenna adjustment. The low unit weight and superior design of solid post avoids easy cheap and installation.

With 15 years experience in the design and manufacture of commercial masts and antennas, which are used from the frozen wastes of Antarctica to the deserts of the Middle East, supplied to NATO, the U.N., the Red Cross, the British Antarctic Survey, H.M. Government and to all continents, in fact, to over 100 countries.

We stock the largest range of masts and antennas in the U.K. from the Versatower (copied but not equated) to the products of Belgium, England and Australia detailed below.

**ALIMASTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Dimensions</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELESCOPIC LIGHTWEIGHT</td>
<td>3 or 15m.</td>
<td>£38-75</td>
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<tr>
<td>Quick lock sections</td>
<td>3 or 15m.</td>
<td>£42-50</td>
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**CUSHCRAFT**

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<thead>
<tr>
<th>Description</th>
<th>Dimensions</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>VHF OMNI (Carriage 95p)</td>
<td>124m.</td>
<td>£38-75</td>
</tr>
<tr>
<td>RINGO RANGER ARX</td>
<td>6db gain (over 1)</td>
<td>£50-75</td>
</tr>
<tr>
<td>Single mast radiation, excellent. 50 ohm match uses 3 x 14 in phase and 4 stub, 145 MHz version approx. 9&quot; 6&quot; (14 lbs.) 3.5 MHz approx. 3&quot; 6&quot; (illustrated).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARX2 Ringo Ranga</td>
<td>45 MHz</td>
<td>£21-50</td>
</tr>
<tr>
<td>ARX2 3 db Ringo Vert</td>
<td>£21-50</td>
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**JAYBEAM**

<table>
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<tr>
<th>Description</th>
<th>Dimensions</th>
<th>Price</th>
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<tbody>
<tr>
<td>70 (4m), 142 (70) (Carr. E1 VAT 124%)</td>
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<tr>
<td>DB/2 3 over 8 slot feed</td>
<td>£31-40</td>
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<tr>
<td>5XY/2 5 over 8 slot feed</td>
<td>£31-50</td>
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<tr>
<td>MB/2/10 8 over 10 slot feed</td>
<td>£31-60</td>
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<tr>
<td>MB/2/10 10 over 10 slot feed</td>
<td>£31-75</td>
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<tr>
<td>MB/2/10 2 over 10 slot feed</td>
<td>£31-75</td>
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<tr>
<td>TY/2 6 over 10 slot feed</td>
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<tr>
<td>TY/2 7 over 10 slot feed</td>
<td>£31-95</td>
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<tr>
<td>TY/2 8 over 10 slot feed</td>
<td>£32-05</td>
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<tr>
<td>TY/2 9 over 10 slot feed</td>
<td>£32-15</td>
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</tr>
<tr>
<td>TY/2 10 over 10 slot feed</td>
<td>£32-25</td>
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**SMC TRAPPED DIPOLES**

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<th>Description</th>
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<tr>
<td>500W P.I.P. 14 SWG (Carriage 115p)</td>
<td>124m.</td>
<td>£60-10</td>
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<tr>
<td>150W P.I.P. 14 SWG</td>
<td>£60-20</td>
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**MOSELEY TRIO-BAND BEAMS**

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<th>Description</th>
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<tr>
<td>(Carriage £25 VAT 124%)</td>
<td>124m.</td>
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<tr>
<td>TA3 3 ele. 400W R.M.S.</td>
<td>£60-40</td>
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<tr>
<td>MUSTANG 3 ele.</td>
<td>£62-50</td>
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**GEM QUAD FIBREGLASS**

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<th>Description</th>
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<tr>
<td>(Carriage £2 VAT 124%)</td>
<td>124m.</td>
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<tr>
<td>GQ2E 2 element</td>
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<tr>
<td>GQ4E 4 element</td>
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**G WHIP MOBILE**

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<tr>
<td>(Carriage 95p VAT 124%)</td>
<td>124m.</td>
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<tr>
<td>Trinander 10-20m. (+LF)</td>
<td>£61-40</td>
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<tr>
<td>Multiband 20-40-80</td>
<td>£61-50</td>
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<tr>
<td>Flexihim 18m. (+AP)</td>
<td>£61-60</td>
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<tr>
<td>Basemount 1/4 hole mount</td>
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<tr>
<th>Description</th>
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<tr>
<td>SWR10 (THL) single mast horizontal type</td>
<td>£61-90</td>
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<tr>
<td>SWR20 (BLH) 50 ohm F.S., Pr. 10 and 100W. (±20%)</td>
<td>£61-90</td>
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<tr>
<td>SWR50 (TRH) 50 ohm S.S. F.S., Pr. 50 and 100W. (±20%)</td>
<td>£61-90</td>
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**TELESTOWERS**

<table>
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<tr>
<th>Description</th>
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<tbody>
<tr>
<td>TELESCOPIC GALVANISED 10 ft sections c/w guy rings, etc.</td>
<td>£65-70</td>
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<tr>
<td>Carriage £2 Ex-Stock VAT 8%</td>
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<td>Carriage £2 Ex-Stock VAT 8%</td>
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**HY GAIN HFRANGE**

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<tr>
<td>BNG6 1 1 yr line Balun</td>
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<td>101BA 10m. 3 element</td>
<td>£66-00</td>
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<tr>
<td>151BA 15m. 3 element</td>
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<td>201BA 20m. 4 element</td>
<td>£66-00</td>
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<tr>
<td>PMH2M 2 way harness</td>
<td>£66-00</td>
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<td>PMH2/C tire. phasing...</td>
<td>£66-00</td>
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<tr>
<td>D8/2M 8 slot feed</td>
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<td>D5/2M 5 slot feed</td>
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**BANTEX**

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<tr>
<td>VHF WHIPS (Carriage 90p VAT 124%)</td>
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<tr>
<td>BGA PG 2m. fiberglass</td>
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<tr>
<td>701 70 MHz fiberglass</td>
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<tr>
<td>14+1 145 MHz fiberglass</td>
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<tr>
<td>5S 155 MHz fiberglass</td>
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**COAX PLUGS**

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<tr>
<td>(Post and Packing Extra) VAT 8%</td>
<td>124m.</td>
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<tr>
<td>PL259 Standard UHF plug</td>
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<tr>
<td>UHF fixed reducer</td>
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<tr>
<td>&quot;Solderless&quot; UHF RG58</td>
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<td>RG58</td>
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**ROPES**

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<tr>
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<td>5mm. HT steel</td>
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<tr>
<td>6mm. HT steel</td>
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**AERIAL INSULATORS**

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<td>(Post Extra) VAT 124%</td>
<td>124m.</td>
<td>£60-10</td>
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<tr>
<td>NT4 polyprop ribbed</td>
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<tr>
<td>NT5 polyprop ribbed</td>
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**AERIAL WIRE**

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<tr>
<td>(Carriage Extra) VAT 8%</td>
<td>124m.</td>
<td>£60-10</td>
</tr>
<tr>
<td>14 SWG hard drawn Cu yd.</td>
<td>£60-10</td>
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</tr>
<tr>
<td>14 SWG copper braid</td>
<td>£60-10</td>
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**CABLES**

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<thead>
<tr>
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<tbody>
<tr>
<td>(Carriage Extra) VAT 8%</td>
<td>124m.</td>
<td>£60-10</td>
</tr>
<tr>
<td>RG58U 50 ohm heavy</td>
<td>£60-10</td>
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<tr>
<td>RG58U 50 ohm flat wire</td>
<td>£60-10</td>
<td></td>
</tr>
<tr>
<td>RG58U 50 ohm flat wire</td>
<td>£60-10</td>
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<table>
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<th>Description</th>
<th>Dimensions</th>
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Silent Key

It is with the deepest sorrow that we have to announce the death, in his 70th year, of Austin Forsyth, O.B.E., G6FO, Editor of "Short Wave Magazine" since 1938.

As his death occurred while this issue was closing for print, a full Obituary will not appear until the March issue.

"Short Wave Magazine" will continue under the direction of the Assistant Editor until the new Editor is able to take up his position. In future all correspondence which previously went to Buckingham—particularly material for the feature articles—should be addressed to the Welwyn office.
COMMUNICATION and DX NEWS

LAST time, we commented on the sudden onset of cold weather and its impact on those poor souls with outside shacks; and as this comes to be written those same chaps will doubtless find a shovel an indispensable aid to DX-ing—as the only way of getting a path to the shack and the rig! As for the writer, he has spent most of his valuable DX-ing time just loafing near the sources of warmth and sustenance.

Which is not to say the bands have been useless; far from it, the usual ups and downs have been noted, and each week there seems to have been significant sunspot activity; all in all not bad for the time of year is a reasonable comment on the state of the bands.

Forthcoming

As we have mentioned in previous pieces of late, the true-blue DX-pedition merchants are, it seems in hibernation, but there are rumours around for those with an ear to the ground. For example OH2BH has been looking into the situation regarding Bouvet; the LA-group left on November 22, and were going to operate as 3Y0CC from End-Antarctica, heading back at the end of January for home by way of Bouvet and Cape Town; however, the snag is that Bouvet will only be to stop-over if the weather permits, the general consensus of opinion is that it is a very good band on its day—but there haven't been any days this time round! Thus the comments range from "Gave it a miss" to "heard nothing" and so to the ultimate "Oscar Six heard!" and, while the moment of writing is not necessarily the time when no more news will come in, we feel reasonably confident in closing down the file on this band, at least in DX terms.

Ten Metres

The general consensus of opinion is that it is a very good band on its day—but there haven't been any days this time round! Thus the comments range from "Gave it a miss" to "heard nothing" and so to the ultimate "Oscar Six heard!" and, while the moment of writing is not necessarily the time when no more news will come in, we feel reasonably confident in closing down the file on this band, at least in DX terms.

Fifteen

There are many who say this is the best band of all for DX activity over a period of years; the occasional off moments being offset against the noise and QRM on the lower bands, and your scribe will admit to some sympathy with the idea after a few trials during holiday or illness periods midweek, rather than judging solely on the heavy occupancy at weekends. One must envy those few who, for one or the other good reason, can keep a rig at the saltmine, and chase DX while dictating letters or whatever!

All this having been said, along comes G4EAN (Nottingham) who had just one day, with the TH3 cranked up to fifty feet and the linear switched in—and he picked a bad 'un!

GM3YOR (Kirkcaldy) made good use of his holiday time, and was to be heard on all the bands at one time or another, always on CW; 21 MHz catches were CO2BB, W2CRG, K4TM, WA4SFN, W8CYA, and WB9RZU; but, says Drew, the list of Gotaways was much longer!

G4EDG (Newton Abbot) definitely favours this band, one feels. Be that as it may, it came up with UA0YT in that elusive Zone 23, VP2VDJ, 5Z4NH, VP2ABC, VK80B, A9XB, ZS5ZD/3D6, P29JS, WA6EGL/QV9, ZL4NA, ZL3GQ, A4XVK, CO2BB, VS6AF, ZD8W, K4DBZ/C6A, VP2M, VP2LDT, W6FDG/6Y5, AP2AL, JA1P1G/PZ; but no more JA's. Interestingly enough, Steve comments that much of the DX on this band was worked by throwing out a CQ call on an apparently dead band.

G4DMN (Wirral) stuck to Eighty for most of the time, but he did make pilgrimage to 21 MHz once; his prayer yielded a QSO with PY0ZAE on Trindade Is.

Now Twenty

This, most people would say, is where the action is—when the band is open, which at this time of year means the times when we are at work! But, alas, there is not much we can do to alter the Laws of Nature, however much we would like to. The first thing any regular user of the band would ask, had he been away for a few days would doubtless be "Has that Pestential Noise-Thing from Poltava gone away yet?"—to which our cautious
reply would have to be that it
doesn’t seem to be around quite as
much as previously (at least, when the
writer has been around—he has
not had much chance to enquire of
other DX-ers if they have met up
with it at their preferred operating
times). It has also been noted that
the strength of the Thing when it
is on, with an aerial of reasonable
quality but short of the gain of, say, a
beam, is such that it is capable of driv-
ing the receiver into non-linear operat-
ing the receiver into non-linear operat-
in the receiver front-end.

Our first stop is with G4EVO
(Broadstairs) still knocking them
off with his five watts and Joystick.
This month the pattern seems to
have shifted from Eighty largely to
Twenty, and the couple of watts of
RF output from the machine seem
to have connected to most of Europe
and out on into Asia; the interesting
thing about these real QRP contacts
on CW to the writer is to survey the
incoming reports as compared with,
say, a station running 100 watts
output; over the few pages of com-
parison, in both cases the average of
R4 or poorer reports received comes
out at about one QSO per standard
log-book page which is an interesting
statistic, it would be rather interest-
ing if someone who operates to the
tune of around a log page a week-
i.e. both sides of a page in a fort-
night—all CW, and someone else
who does about the same rate of
operating but all SSB were to
send us Xerox or similar copies of
the log pages for a couple of months,
to compare against G4EVO’s QRP
flex-power and simple receiver of the
Argonaut. And of course, one must
also accept that G4EVO might be a
Senior Citizen, but he has been
using Morse for umpteen years before
ever he took to our bands, which
no doubt explains much of the
reason why his incoming report is
R4 but he is disinguing R5 to the
chap at the other end despite the
simple receiver. With the exception
of Andorra, and possibly Monaco,
one cannot recall any European
country with which the little box hasn’t
completed QSO’s.

Twenty is an uphill slog all the
way compared with Fifteen, avers
G4EDG, who consequently didn’t
put in a lot of time on the band: Nonetheless, he worked VK4YS,
ZL3FM, DJ0UP/VP2D, VP2LDT,
W7LCF in Wyoming rounding things
off. However, the month was not
without its problems, the rig having
done its celebrated imitation of
Guy Fawkes night, burning out the
PA RF Choke, the PA bottles, and
most of the shack mains wiring
while he was on receive!

Twenty for GM3YOR was all
CW this time: PY7APS/I, PZ1AP,
UW9WL, W1YVE, K2OZ, K2TD,
W4QQN, W6WU, W9PA, and
VE3DMC not to mention lots of
Gotaways.

With cautious optimism, G2HKU
(Shapley) notes that his ZL sked
contacts have held up better this
winter than last, at least until the
time of his letter, but on the other
hand static-charged rain has been a
bit of a nuisance at times. SSB
skeds were kept, as for many years
with ZL’s, notably ZL1AE, ZL1VN,
ZL1DB, and ZL3SE, while
a spot of brasspounding managed to
get into the system, and then having
a slow and thorough winnow through
the rest, to those who normally
write the band off as not worth
bothering with.

However, to return to our muttons,
GM3YOR doesn’t seem to have
spent a lot of time on the band, but
he did stamo on it enough to shake
out CW exchanges with UA9WBY
and ZS5A.

G4EDG met up with the Russian
Thing from Poltava on occasion,
and was irritated enough to modify
his FT 560 by hoicking out the noise
limiter, and using the hole so
obtained to fit an attenuator; like
everyone else who has tried it,
Steve found it made an improve-
ment—for example, VP2EEQ,
U1A8Q, U1A8AH, WB9EED,
JE3MCC, EA9EO, PY1RO/O and
PY0FOC, both on Fenando da
Noronha, PY0ZAE still doing busi-
ness on Trinidad Is., W0HR
and ZD8TM in the pre-Christmas
era, plus UM8MAO, TF30F,
YS1JWD, K92EP, VE1ZZ, K4CG,
K8ID, VO1KE, 9Y4A, VP2M,
FG0BG, and W7NW for Arizona.

CW on Forty was used, but only
once, by G2HKU, when he made
contact with UD6DT.

Forty

Someone known to the writer
once described it as the “Roaring
Forties”—a not inept description
where you come to think of it, for a
band where, at this season and section
of the sunspot cycle, one may burrow
down through the noise at more or
less any time with some hope of
finding gold among the dross. One
may recall a couple of months ago
someone remarking that the use of a
Q-Multiplier and audio filter plus
a careful tune of the band could
dredge up some most remarkable
things in the line of DX. Your
scribe, as remarked last month, had
a dud battery in his MFJ filter, and
so had to go out and buy one—
aren’t they a price these days!—
and having fitted it, tried the filter
by plugging into the TS520, which
by luck happened to be tuned-up
around mid-band on Forty. So,
with the ‘520 on CW, receiving it
through the MFJ filter, and with
around 20 dB of attenuation in plus
the maximum the MFJ could give,
we crawled up and down Forty at
a snail’s pace for thirty minutes.
This, around 2100, and when condi-
tions didn’t seem all that dandy;
EU’s of course, but a layer or two
down one immediately ran across
a brace of VK’s, a JA, and several
East Coast W’s, all good copy.
South America, and a questionable
African—further investigation of
the latter was cut short by a telephone
call. At the time, 14 MHz and up
were dead. Old hands know this,
and, one suspects, keep the good
news to themselves!—but the point
we were trying to get over is the
advantage of throwing everything
in the way of selectivity one has
got into the system, and then having
a slow and thorough winnow through
the rest, to those who normally
write the band off as not worth
bothering with.

Here & There

CQ has produced the results from
Looking a little further ahead, we have the Swiss Contest H22 dates as 1500z April 23 to 1700z April 24. This one is a CW and a Phone contest all rolled into one, as the only restrictions seems to be to bar cross-mode contacts and contact-banders. Exchange RST plus a serial number starting from 001 (The HB's will also send after the number their two-letter abbreviation for their Canton, which must be noted). Final score is the total QSO points at three points a QSO on each band plus a multiplier of the number of contacts (a maximum of 22) worked on each band. Logs to be postmarked not more than thirty days later than the contest, and addressed to: TM USAK, HB9AHA, im Moos, 5707 Seengen, Switzerland.

On an entirely different tack, we have a letter in from G4CJG, who hopes to be going /MM, aboard the MV Ocean Transport, GH7H, from January to April, using FT101B and an 18AVT/WB, the crystal frequencies being 14104, 14243, 14330, 21104, 21243, and 21330 kHz. Look out for him around 1300z or 1830z.

Earlier on we mentioned the AJ3AA marathon; oddly enough there was a similar domestic effort going on in Top Band, where G8KP up in Wakefield looks to have run up in excess of 3000 contacts in 1976 on Top Band alone! Nick, G2NJ, who passes this information on, has his QSL as the 3000th contact. It all started as a bit of a joke, G8KP having booked in quite good business at the start of the year, and he decided to see whether a reasonable QSO-rate could be maintained through the summer and indeed the year—it so panned out that Bill only missed two contacts in the summer and indeed so panned out that Bill only missed four or five days. Just to make it a little harder, G8KP added himself another Rule, which said only one QSO with a station per day.

EIGHTY

QRP results are the thing that interests G2NJ—and many others too—on Eighty; Nick managed to work G3XUL who had an input of one half watt, a shining example of what can be done, and that on a very noisy band; then there were G3FMW in Harrogate, G3GET in Sittingbourne, at 2-8 watts, and G3KPT in Birmingham who has an HW8 and has already in a few weeks racked up an impressive total of countries worked with it.

G3CED (Broadstairs) hasn't managed the time to get on the air this past month, due to pressure of work, but he did find time to send on the G4EVO log, commenting that G4EVO was nurturing a 'flu bug and had joined the QRT brigade temporarily.

Which takes us to G4EVO. Frank, as has already been said, was using Twenty far more than Eighty, but the latter was not completely forgotten. A favourite contact seems to have been with G2CAS in Harrogate, QSO's with John having accounted for half the 3-5 MHz activity; the rest seems to have been up and down the country and nearer Europe, it being understood that G4EVO is a strictly day-bird, his latest QSO on any band being 1600z.

GM3YOR looked in on the band for a moment, and a little “fishing” in the muddy waters with CW eventually netted WHOC.

G4EDG found it a “decidedly LF sort of month” at his shack, with Eighty opening up at definitely civilised hours—not much before 0700, and DX being about at times like 2100; the pickings include KP4BCL, UH8AI, HC2SL, PY0FOC, PY0ZAE, UA0AG, UW0AJ, EA9EO, UL7TBM, LU8AHW, ZL3GQ, W6PM, and W1GN (Oregon) on CW, while the SSB hooked up with YV1TO, and CTZUB, the latter, as Steve puts it “all my own work and not on the DX Net!”

G4DMN seems to have concentrated on Eighty, with an 18AVT on the one hand and also an inverted-vee with it's apex at fifty feet available. In December this was the way of things on SSB: EA8's, EA9FE, EA9FL, FG0CRZ/FS7, FG0MM, FP8DX, FP8MM, JA6GDG, JW9FD (Bear Is.), HP1YV, OD5LK, UK9AAN, UL7IBC, VE3, VE2, VP2LDU, VS6DO, all W call areas, XE1FR, XE1LFW, YS1JWE, 6W8A, 6W8FP, 9K2DR, 9L1NP; while the January letter indicated eighty-only as the current ploy, with CW to UF60AA, and UH8DU, plus SSB to CN8BF, FG7AO, WA6UAG/
FM0, FM7AQ, HP1YV, HI8RRD, JA1KXY, JW9WT, K6UA, K0RF, KZ8HP, KZ2ED, OY2A, PY5AGK, PJ8UQ, PY5ALD, SV0WZ, TI2BY, UK9AAN, VE1-3, VP2EEQ, VP2VBG, V9L2DU, V88RR, WI-5, W8-0, XE1FR, XE2AX, XE1KB, YS1AG, ZF1AK, K2IZN/4X, 4X4BT, 4X4AS, 4X4UB, and 7X0BL.

G2BJY (Walsall) continues his Eighty-metre activities, with a spot of receiver home-brewing on the side; so far the beast has been tested and found good on Top Band Eighty; and found good on Top Band Eighty side; so far the beast has been tested of receiver home-brewing on the Eighty-metre activities, with a spot 4X4BT, YS1AG, VP2VBG, VP2LDU, VE8RR, W1-5, K6UA, KORF, FMO, FM7AQ, HP1YV, HI8RRD, have to and found good on Top Band Eighty side; so far the beast has been tested of receiver home-brewing on the Eighty-metre activities, with a spot 4X4BT, YS1AG, VP2VBG, VP2LDU, VE8RR, W1-5, K6UA, KORF, FMO, FM7AQ, HP1YV, HI8RRD, have to and found good on Top Band Eighty side; so far the beast has been tested of receiver home-brewing on the Eighty-metre activities, with a spot

As always, reasons will out, and it it was sparked off by G2BJY being at all! marvel that QSL cards ever arrive you add up the number of ways in which an out-going QSL can fail to result we pro-

We have already mentioned the G8HX of Mansfield had joined the ranks of the Silent Keys; Frank had been a reader and occasional contributor to this piece since first your scribe took over the writing of CDXN; and for many moons he was the Hon. Sec. of the Mansfield club. He will be missed from the scene of Amateur Radio.

**Top Band**

We have already mentioned the G8KP Top Band marathon, which was brought to our notice by G2NJ; and the fact that it was G2NJ made one wonder what Nick was up to, he not having been heard on Top Band for many moons. As always, reasons will out, and it it was sparked off by G2BJY being at all! marvel that QSL cards ever arrive you add up the number of ways in which an out-going QSL can fail to result we pro-

It was only by chance that your conductor became aware that G8HX of Mansfield had joined the ranks of the Silent Keys; Frank had been a reader and occasional contributor to this piece since first your scribe took over the writing of CDXN; and for many moons he was the Hon. Sec. of the Mansfield club. He will be missed from the scene of Amateur Radio.

**QSL’s**

We have already touched on the number of ways in which an out-going QSL can fail to net its due reply even though the intended recipient is known everywhere to QSL 100 per cent to incoming cards; one of the more obvious ways is send the card to the wrong person! Thus, this collection, culled from W1WY and West Coast DX Bulletin might help: 5W1AB, to W4KA, Leo Haisjman, 1044 S.E. 43rd Street, Cape Coral, Fla. 33904, U.S.A.; A4XV to G4BVH; A6XS to G35UW; G31IX to DK9FE; C31NA to F2PC; C31KA to c/o Klaus Gerlach Am Muehlrain 12, D-644 Bobra, West Germany; OE5GML/YK to OE5REB; PJ8CO to K1CO; TA2DX to DJ9ZS; VP2EEQ to Yasme; FR7BE to B.P. 137, Tampon, Reunion Island; HC5EE to WA8TDY; XT2AG to W1AM; VQ9DF to ON6FN; VQ9HCS to WA1HAA/4; VR3AH to K2BT; VR3AK to KH6AHZ; VR3AR to WA3GQA; VS5MC to DJ5JA; VS6DO to K4CIA; and FP8DS to K90TB. And one has to admire the optimism of WCDXB’s heading to the list of QSL addresses: “Strike it Rich!”

**Mailing**

In an already “difficult” situation because the January issue date fell so near the deadline, it was no great help when a packet contrived to go astray containing some CDXN materials; so will the unfortunates who have missed their mention from this piece accept our apologies—but on the other hand, don’t shoot the postman!

Having relieved himself of that broadside, your scribe must now come back to the point of the matter insofar as concerns CDXN. In an experiment to improve our internal communications system, we propose, for the moment, to ask everyone to send their material to the Welwyn office, from where the internal sorting will be done; we hope this will help us to get the material to their various users, such as Club Secretary, your conductor, or VHF Bands, or indeed SWL. In due course we may try other changes to the same end, of which we will speak if and when we come to them.

By the time this comes to be read, we should be beginning to see the beginning of the Spring lift in radio conditions and be at the worst point of the winter weather-wise with only improvement to look forward to—and that can’t be bad! However, the season brings its risks, so we hope all readers will take care if the winter continues as it seems to have started!

**Finale**

Let’s hope we shall all be dead on target next time, in which case your contributions should be posted to arrive by first post on February 8, addressed to your scribe, CDXN, SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ. On the other hand if there are problems, mail can be, for this month only, sent direct to your scribe—the address is OK in Callbook—to arrive by first post on 10th.
THE OTHER MAN’S STATION

The subject of our picture is G3TKL, owned and operated by W. R. Longmire, Overlea, Stanah Road, Thornton Cleveleys, Blackpool, Lancs., who was first licensed in 1964, after attending R.A.E. classes and brushing up his Maths and Algebra. As he admits having been born in 1895, that meant that he was all but seventy when he started on the trail towards an AT-station licence—which should be a great encouragement to all those more senior SWL’s who do not try for their ticket, on the grounds that “learning is too hard at their age!”

His first contact with “Signals” came with his enlistment in New Brunswick in 1914; and in the course of that war he was wounded four times. At the end of the war, G3TKL attended a course in Electrical Engineering at Nova Scotia Technical College and by 1921 was Chief Inspector, Electricity and Gas, Province of New Brunswick. However, the young man has to have his fling, and so in 1926, G3TKL returned to England, when his parents had emigrated twenty-odd years before, and started at Manchester Technical College, taking a course in Flour, Confectionery and Sugar Confectionery, and the following year he was able to make a start in this line of business. Through Hitler’s War G3TKL was in the Observer Corps, but still managed to build up his business until by 1945 he had 63 employees. In that year he retired, and fifteen years later the radio bug bit; after three years of SWL, it was a case of “back to school” on the R.A.E. trail, with G3TKL at the end of it.

Looking at the picture, there is a nice assortment of old and new, commercial and home-brew. Codar, Collins, Drake, and KW are all represented; outside there is a Versatower with a Mustang three-element beam on top; and the G3TKL shortened Top Band vertical which quite a few people use, although G3TKL himself is careful to say that “It can be over-rated” which is less than fair to himself.

Under the digital clock at the centre of the console, the sharp-eyed will have noticed what looks very like the paddle of an el- bug—it is just that, and on the very day he posted the picture to us, his incoming mail contained a R.N.A.R.S. certificate for copying their QRQ runs at 20 w.p.m. G3TKL might be over eighty, but he is a very capable operator; long may he be able to continue his activity on the bands.
R.A.E., Q. & A.

SUBJECT No. 765, MAY 1976 — ANSWERING ALL QUESTIONS

THE May 1976 Radio Amateurs Examination results here presented were written out in longhand by the writer, less the Figures, in 24 hours; of course to produce from this script the copy and figures for publication took considerably longer. Bear in mind that this included the extra questions which a candidate can neglect as he chooses, and that it also included both halves of the Question 3. It is thus reasonable to expect that the average candidate should be able to produce answers of this standard in the time allotted if he is well prepared.

From the candidate's point of view, and assuming he is adequately prepared, it is perhaps germane to consider which questions not to answer in Part 2, bearing in mind that one is required to answer any six from eight. As each one is to be allocated twenty minutes, so as to get the required number of answers plus time to "dot the i's and cross the t's" (not to mention the careful reading of the paper before you pick up your pen), any questions which look as though more than 20 minutes to solve will be needed should be regarded as last-ditch efforts, only to be tackled if one has a mental block on other questions (i.e., one is not fully prepared!). In the May 1976 paper, one feels that Question 3 comes into this sort of category, for the following reasons: 1. You have to produce either an adequate drawing of a diode, or one of a semi-conductor rectifier, followed by an adequate explanation of how the chosen one works; and 2. Having done this, you have to draw the circuit diagram of a PSU, and explain its working principles, which means that one has to talk about a transformer, a bridge rectifier (and, note, what is commonly called a "full-wave" circuit using two diodes only is in fact a bi-phase half-wave with the transformer secondary centretap as the "common" of the output, which, strictly, is not a full-wave job although the writer would feel a candidate who drew and explained this circuit would "get away with it" on the grounds that it is so commonly called full-wave), show how the output looks at the bridge, and how this becomes smoothed by the capacitor, not to mention describing how the volts travel the way they do through the various diodes of the bridge. All this lot adds up to far more than 20 minutes for a good answer. Question 8 also comes near to falling into this category if it is to be dealt with adequately.

Calculators are allowable now, and no doubt there will be people using them; if a "scientific" machine is taken to the Ohms Law problem at Question 5, and the numbers pushed in and inverted using the l/x key, don't forget that, when you get the startling "2 times 10^-2" you have to again punch the I/x key to get out the proper answer which of course is 50 ohms! The reason for this being so confusing is that when the "scientific" machine goes into algebraic notation the "10" in the above statement is assumed, which can confuse a user who can read it as 2^-2—a vastly different number!

One final point; and it is a very important one. There are various drawing conventions, which are generally understood, but Fig. 1 is drawn to the British Standard one used by the printers of the R.A.E. paper, in which the rectangles take the place of the zig-zag line normally used to symbolise a resistor; the rest of the illustrations are drawn to the normal Magazine convention, which will probably be very similar to the convention used by candidates.

RADIO AMATEURS EXAMINATION, MAY 1976

The examination is divided into two parts; failure in either part will carry with it failure in the examination as a whole.

Each question in Part I carrier 15 marks; each question in Part II carries 10 marks.

Answer EIGHT of the following ten questions as follows: BOTH questions in Part I, and SIX questions from Part II.

Q.1. (a) List the types of messages and signals which the holder of an Amateur (Sound) Licence is authorised to receive.

(b) What are the requirements on a licensee who receives a message the receipt of which is not authorised by his licence.

(c) On what frequencies, or bands of frequencies, should an Amateur (Sound) station be equipped for reception.

Answer 1

(a) Messages from other amateur stations which are remarks of a personal nature to the licensee or to the station with whom he is in contact; procedural signals in connection with such messages; messages from other amateur stations in connection with disaster relief operations conducted by the British Red Cross, the St. John Ambulance Brigade, or any police force in the U.K., at the request of these organisations, plus the procedural signals in connection with such messages; and any signals in the Standard Frequency Service.

(b) He must not copy, or allow a copy to be made, of it, or disclose it, its content, or the fact of its existence, except to a duly authorised officer of Her Majesty's Government, a person acting under the authority of the Secretary of State, or a competent legal tribunal.

(c) On all bands and modes of emission for which the station is equipped.

Q.2. See Fig. 1, which is part of the question, and note the drawing convention used.

Fig. 1 shows the circuit of a low power amplifier for a Morse telegraphy transmitter.

(a) State the function of

(i) L1, R1 and C1

(ii) R2 and C2

(b) What are the disadvantages of keying the oscillator stage of a transmitter?

Answer 2

(a) (i) So modifying the shape of the RF output envelope waveform of keying that the square edges are "rounded off" to a sufficient degree to prevent the transmission occupying an excessive bandwidth due to key click radiation.

(ii) R2 and C2; the presence of R2 is enough to prevent the valve cathode shooting up to HT plus rail voltage when the key is open-circuit and thus saves risk of over-running the heater/cathode voltage rating under keying; C2 is present to decouple the key-leads
to RF. (Editors Note: Many candidates will no doubt have thought of R2 and C2 as providing protective Class A bias to the valve in the event of a drive failure; but even though no values are given, this answer must be incorrect as in such an event keying would not be arranged as shown in the drawing due to the presence of a “spacer” under key-up conditions.)

In addition to the above points, it should be noted that the presence of R1 and C1 will also tend towards reduction of sparking at the key contacts, thus reducing the “local” clicks due to sparking being radiated by the keying leads external to the transmitters; some compromise between the main function as outlined in (i) above, and the spark-reduction function should enable one to radiate a clean RF signal and still hold sparking down to an acceptable level from the TVI/BCI point of view.

(b) As an oscillator stage is keyed, the voltages at the terminals of the active device will of necessity be changed. As these voltages change, so will the oscillator frequency to some extent change. Hence, if the voltage change occurs quickly the outgoing signal will sound dicky, but if an attempt is made to slow them down the result will be a chirp on the outgoing signal. In addition, if there are more than one Class C stage between the oscillator and the aerial, these will in any case square up the signal under keying conditions and so give clicks unless some special method of “differential” time-constant keying of several stages is adopted.

Part II—Answer ANY SIX questions from this part.

Q.3. (a) Describe, with the aid of diagrams, the operation of EITHER
   (i) a thermionic vacuum diode, OR
   (ii) a semi-conductor rectifier.
   (b) (i) Draw the circuit diagram of a full-wave rectifier power unit capable of providing a smoothed output of 25 volts at 2 Amps from a 240 volts 50 Hz a.c. mains supply.
   (ii) Describe the full-wave rectification action of the diodes.

Answer 3

See Fig. 2 and Fig. 3, covering the valve and semi-conductor diodes respectively, plus Fig. 3c which is the circuit called for at 3(b)(i).

A thermionic diode consists of a heater/cathode assembly, surrounded by and separated from, an anode, as shown, the whole being placed into a glass envelope which is then given a high degree of vacuum.

The heater is within but insulated from the cathode, and carries sufficient current to raise it to a temperature at which it will heat the cathode to its correct emitting temperature; this heater is the first bit to glow red inside the valve when it is switched on. The cathode may be its own heater (filamentary type) in the higher power ranges, or most likely will be just a cylinder as drawn, surrounding the heater, and coated on its outside surface with suitable oxides to ensure adequate emission of electrons at operating temperature.

In the absence of any voltage on the anode, or any external path from anode-cathode, the electrons which are emitted remain around the cathode, forming the “space charge” around the cathode. When the anode is given a voltage positive with respect to cathode, and a return path to cathode exists outside the valve, then the electrons will be drawn from the space charge towards the anode and current will flow in the external circuit. If the anode does negative with respect to cathode, any electrons will be repelled from the anode and stay in the space charge; thus in this case no anode current flows, and we get the characteristic curve shown at Fig. 2b. The flattening at the upper end of the curve arises when the anode current tries to rise higher than the emissive
Now reverse the battery connections, and it will be seen that the polarity is such as to cancel the barrier potential and so encourage migration across the junction as shown in the curve of Fig. 3b; the curvature at the bottom end is due to the low external potential not completely overcoming the barrier potential, and current increasing as the external voltage gradually rises and completely cancels the internal potential from when on the curve is fairly linear to the limit of the device. It should be noted that the small reverse current is shown to a different scale, for example nanoamps reverse current and milliamps forward current.

Consider Fig. 3c. A transformer capable of the desired voltage and current is selected, and four diodes capable of carrying considerably more than the mean current of 2A to be taken from the load; they should also have a peak inverse voltage rating of at least 50V to allow for the occasional “spikes” of high voltage coming in on the mains supply. The capacitor may be, say 5000 µF at a working voltage rating of 30 volts, electrolytic. Let the top end of T1 secondary be positive with respect to the bottom; current flows through D1 to the positive terminal of the capacitor, through the load, and back to the bottom of the secondary through D2, the other two diodes being back-biased and so non-conducting. Thus, initially a heavy current flows into the capacitor as well as into the load, so that it is charged to the peak voltage or near it, and when the voltage starts to fall away the capacitor discharges through the load and so keeps the voltage across the load nearly constant. Once the secondary potential has reversed, D3 and D4 can start to conduct and D1, D2 are now back-biased, so again charge flows into the capacitor and into the load in parallel until the voltage is past its peak when again the capacitor discharges into the load to hold the voltage across the load terminals to a reasonably smooth DC voltage depending on the capacity used.

Q.4. (a) What factors decide
(i) The ratio of output volts to input voltage in a power transformer
(ii) The maximum secondary current that may be permitted to flow?
(b) A power transformer has a primary winding of 1600 turns and a secondary winding of 200 turns. If the primary is connected to a source of a.c. at 240 volts 50 Hz, what voltage will appear across the secondary winding? (Assume losses to be negligible)
(c) Describe a typical low frequency power transformer and state why a laminated soft iron core is used.

Answer 4
(a) (i) The turns ratio.
(ii) Neglecting losses and assuming correct design, the primary volt-amps and the secondary volt-amps will be equal until saturation of the iron core occurs resulting in losses given up as heat; on the other hand, if the secondary (or the primary, for that matter) is wound with wire too thin for the required current output, then copper losses will occur due to Ohms Law, and again the transformer will heat up.
(b) 240 x 200
\[ \frac{240}{1600} = 0.15 \text{ volts RMS.} \]
(c) See Fig. 4. The winding is wound upon a bobbin, primary first, then a Faraday screen, followed by the secondary; each layer of winding is interleaved with paper or tape. The wound former is then fitted with a "stack" of laminations each of which is insulated on one side; each lamination is of E shape, or U's and T's may be employed, to form a closed iron magnetic path around the winding and through the centre of the bobbin, and a clamp or bolts holds all together. It is then tested "in the white" after which any encapsulation, dipping or fitting in an oil-filled can is completed. The laminated iron core is employed to give a high-permeability magnetic path without the eddy current losses which would occur if a soft solid iron core were used, by preventing the core from acting as a short-circuit turn.

Q.5. (a) State the formula for Ohms Law, and identify the units used.

(b) Three resistors of 100 ohms, 150 ohms, and 300 ohms respectively are connected in parallel. What is the total resistance and what current flows if an EMF of 15 volts is applied to the combination?

Answer 5

(a) \( E/I = R \), where \( E \) is in volts, \( I \) is current in amperes, and \( R \) resistance in ohms.

(b) See Fig. 5. The formula for calculating the total resistance is \( 1/R_T = 1/R_1 + 1/R_2 + 1/R_3 \).

Thus \( 1/R_T = \frac{1}{300} + \frac{1}{150} + \frac{1}{100} \), whence \( R_T = 300/6 \) or 50 ohms.

Now, we have an EMF of 15 volts applied to 50 ohms. Transposing the formula, we get \( E/R \) equals \( I \) in amps, or we can multiply by 1000 to bring to milli-amps.

So, \( I \) (ma) equals \( 15/50 \times 1000 \), which is 300 ma.

Q.6. (a) Describe, with the aid of diagrams, the construction of:

(i) a balanced feeder line

(ii) an unbalanced feeder line.

(b) What is meant by the characteristic impedance of the line, and what factors determine its value?

Answer 6

(a) See Fig. 6, a and b. The "balanced" line is comprised of two wires suitable spaced by an occasional insulator, as in Fig. 6a; or one may come across a variety of balanced line in which the conductors are surrounded by dielectric which also serves as the spacer between the conductors, this latter type normally being found in 75, 150, or most commonly 300 ohm impedance, and being often known as "twin-lead." The open-wire type diagrammed is usually of higher characteristic impedance, around 600-800 ohms.

The unbalanced type of Fig. 6b is normally known as co-axial cable, and is intended to be used with the outer braid conductor earthed, so that the fields are all inside the feeder, between outer and inner, and pick-up of radiation from outside is prevented. Coaxial cable is normally of 50, 75, or 95 ohm characteristic impedance, for use with the half-wave dipole; however, while it is often connected directly to the dipole, it is correct practice to insert a "balun" (Balance-to-Unbalance) transformer between the aerial and the coaxial feeder.

The characteristic impedance of a feeder line is a constant at all the high frequencies of interest to amateurs, and is a function of conductor diameter, conductor spacing, and the velocity factor of any dielectric between the conductors, times a constant which depends on whether the line is balanced or coaxial; the relationship in each case is shown on Fig. 6 algebraically. It may be defined for all frequencies as that value of resistance which, when connected to the end of a finite length of feeder, between the conductors, will cause the generator to "see" the same conditions as would be present were the line of infinite length.

Q.7. (a) What equipment is necessary for accurate (within the terms of the Amateur (Sound) Licence) measurement of the frequency at which a transmitter is operating?

(b) Explain, with the aid of diagrams, the heterodyne method of making frequency measurements.

Answer 7

(a) Preferably a suitable calibrated digital Frequency Meter; or, more usually, an absorption wavemeter (which should be available in any case) and a heterodyne wavemeter.

Consider the circuit in Fig. 7; it comprises, in effect, two valves, the triode being used as a crystal oscillator, while the hexode section acts either as an oscillator, or...
as an oscillator-mixer. The triode can be made, by switching S1, to either oscillate on 1 MHz, or 100 kHz.

The hexode, when operating as an oscillator only considered, is arranged to oscillate between 3.5 and 3.6 MHz; to this end C1 is pre-set to bring the oscillator nearly correct, C2 then being the "main" tuning, sets the oscillator to 3.5 MHz at maximum capacity by adjustment of the padder C3, called "set zero" because the dial of C2 is adjusted to zero with this. At 3.6 MHz the oscillator is trimmed to 3.6 MHz precisely when C2 is at minimum capacity and its dial reads 100, by adjustment of C4 "set 100." C2 dial is then calibrated every 1 kHz from 3.5 MHz to 3.6 MHz, 0-100 on the dial.

Now, imagine we wish to measure the frequency of our transmitter. If we are in real doubt, we would first check with the absorption wavemeter that we are in fact in the area of the desired band, say, 14 MHz, rather than the area of 7 or 21 MHz due to mistuning the transmitter. This being established, we would then listen on receiver, with S1 in position 1, until we had counted the harmonics of the 1 MHz oscillator from 1 MHz upwards and established that we were in fact between 14 and 15 MHz (our transmitter beat lying between the calibrator "pip" at 14 and 15 MHz). Now let us imagine the actual signal to be at, say 14-253 MHz. Switch the S1 to position 2 after returning on the receiver to the 14 MHz position when the "pip" from the 100 kHz crystal should be on the same frequency as was the 1 MHz "pip"—now go carefully upwards in frequency until you hear the next "pip" at 14-1, and then again at 14-2 and 14-3, and note the transmitter signal lies between 14-2 and 14-3 MHz. S2 may also now be switched from position 1 to position 2, and the pip around 0 on the dial zeroed by adjustment of C3, and that on 100 by C4; repeat twice, to be sure both ends of the band are correct as the adjustments may interlock to some degree; this is done by using the headphones, of course.

You now have the 100 kHz signal and the VFO signal in the calibrator mixing in the hexode section, and so there will be an output every 100 kHz upwards and downwards from whatever frequency the wavemeter VFO happens to be on. Hence, the headphones will now pick-up the mixed result of this and the transmitter output signal, giving a zero-beat in the "phones when the dial is set to "33" and an audible beat either side of this, provided the right degree of coupling is used. You may now conclude that the transmitter signal is coming out on 14-253 kHz.

Precautions: clearly one must define one's position initially as being in the right band, as, for example, a signal on 7053 kHz or 21-153 kHz will also zero at the same point on the wavemeter dial; and one must then define one's position as lying between two 100 kHz harmonics of known frequency before the dial reading can be accepted. In addition, of course, such an instrument requires to be stable, a condition best met by running the oscillators permanently, or at least giving a one-hour minimum warm-up period. In addition, X1 and X2 need to be compared at regular intervals against a station in the Standard Frequency Service, as the crystals are subject to aging. This last should be done once in each operating session, at least until the crystals have settled down and aged, after which weekly will probably be sufficient.

Q.8. (a) With reference to a superheterodyne receiver, what is meant by
   (i) Second-channel or image interference
   (ii) Adjacent-channel interference?
   (b) Why must these be taken into account when considering choice of intermediate frequency?
   (c) How does a double superheterodyne
receiver assist in overcoming the types of interference mentioned in part (a) of this question?

Answer 8

(a) (i) Consider a receiver having an IF of 500 kHz, tuned to receive a signal at 1.9 MHz; thus the local oscillator will be running at a frequency of 1.9 plus 0.5 equals 2.4 MHz. Now, a signal at 2.4 MHz plus 0.5 MHz, i.e. 2.9 MHz may be strong enough to “ride through” the pre-mixer selectivity, in which case it will also produce an output at 500 kHz, which cannot be separated from the wanted signal by the IF amplifier. 2.9 MHz in our example would be known as the image frequency for this receiver when tuned to 1.9 MHz.

(ii) Imagine a signal at 1.9 MHz again, and another, unwanted one, at 1.9001 kHz; the two signals will both be amplified in the IF amplifier, and an audio beat note produced at the detector. To deal with this problem requires that the IF should have a suitable “nose” bandwidth between the —3dB down points to just accept a signal of the desired type of emission, whether CW, AM or SSB; and that the bandwidth at the —60 dB down points should be as narrow as possible; the ratio between these two is known as the “shape factor” and a good ratio to aim at is better than 2 : 1.

(b) Good adjacent-channel selectivity is most easily obtained with a low IF, while a good second-channel rejection is best obtained with a high IF; thus a balance must be struck between conflicting requirements.

(c) A high first IF as stated above will give a good rejection of images at the higher (14, 21, 28 MHz) bands; if the first IF selectivity is fairly good, this enables one to mix again down to a lower second IF at which it is possible to obtain a suitable bandwidth and shape factor to deal with the adjacent-channel problem. However, the method is complicated by the fact that one now has three oscillators in the receiver, each having harmonics, and therefore any leakage from these will result in tunable beats, called “birdies” at various frequencies depending on the three oscillator frequencies. To avoid this problem, the double superhet is generally, though not always of limited band coverage, for example amateur bands only.

Q.9. (a) Draw the circuit diagram of a variable frequency oscillator suitable for use in an HF transmitter. Explain how oscillations are set up and maintained.

Answer 9

In answer to part (a) see Fig. 8. This is a FET version of the inverted Hartley oscillator, and would be built at least one band lower than the final output frequency if the normal multiplication method is used rather than feeding into a mixer. Use of an FET is a help in keeping the circulating currents as low as possible and so reducing coil heating from this cause. The drain of the FET is connected to the bottom of the tuning coil, while the source goes to a tap on the coil, so that energy from the drain can be injected back to the gate in such a phase as to cause oscillation by positive feedback; and the positive feedback is kept to a minimum by connecting the source to a tapping point as low down the coil as will sustain reliable oscillation and starting when HT is switched on and off while the load is connected; the latter should be a constant impedance and at least two buffers are recommended before attempting to amplify or multiply frequency. The HT should be fully stable, and of course first-class construction employed.

Q.10. (a) What is meant by the wavelength of an electro-magnetic wave?

(b) How are the wavelength and frequency related to the velocity of a radio wave?

What is the wavelength of electro-magnetic waves in free space at frequencies of

(i) 3510 kHz
(ii) 144-125 MHz

Answer 10

The wavelength may be defined as the distance between the same points on two adjacent cycles of the wave. Frequency times wavelength equals the speed of an electro-magnetic wave (or of light) in free space. Thus F x W equal 3 x 10⁸ metres per second.

Using this formula, 3510 kHz is a wavelength of 8547 metres, and 144-125 MHz is a wavelength of 2-08 metres, because wavelength is equal to 3 x 10⁸/frequency. (Note: in the above question, observe how the given figures in the question refer to amateur bands, so if you got an answer nowhere near to Eighty or Two, you would know you had the sum wrong; and conversely if you had it right you should also know immediately.)
THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March issue: February 9)

A t the time of writing this piece (which, it must be admitted, is a while before the deadline) it does look as though the end result will be short of a few clubs, their reports being still in our "pipeline" when this material has to be posted to The Boss for its processing into material for the printer. There are two reasons for this: firstly, we had a hiccup last month, when our publication day was already put back by a week to allow for the Christmas break, which meant that some Club Secretaries would not be able to get off their offerings before the deadline time; and secondly, although when such a situation has arisen for one reason or another in the past, we have always had a situation where someone, such as for instance old A.J. Devon or whoever, has been acting as a sort of long-stop, catching all the ones your scribe could not receive in time, and nipping up to the office and writing them in before the copy is given to the Editor. This time, for various odd reasons, we can't have a long-stop. Thus, a few are going to miss the sight of their offering in print this time—but rest assured that your material will not be wasted, it will be embodied in next month's piece so far as is humanly possible.

Talking of humanly possible, the thought occurs that this is maybe the first opportunity the writer has had to offer his thanks and reciprocal greetings to all those kind souls who added a holiday wish or a card to their letters; for more than one reason they were deeply appreciated this year. Thanks again.

The Mail

Firstly we have a change of venue to mention, for the Hinckley chaps who are moving to the John Cleveland College, Room H86, Butts Lane, Hinckley, for their fortnightly sessions; projecting forwards from the January data we have it as February 2 and 16, albeit we do not have programme details this far ahead. Murphy's Law being what it is, that is the surest way we have of making quite sure the desired information is forthcoming in the next incoming packet of post!

If, like the writer, one has seen a particular club newsletter year in and year out, one has a pretty fair idea as to how the group go about things. Take for an example Cornish; if one reads their "Link" each month and notes the programmed activity, one realises just how much they can generate their own entertainment each month—it is a rare event for Cornish to listen to a talk from someone not in their own ranks, and they can muster a normal turnout which many clubs in metropolitan areas would greatly envy. G3VWK has the chair on February 3, and he will be telling them all about Measuring Instruments. The place to look for is the SWEB Clubroom, Pool, Camborne.

Next we come to the G-QRP Club; as its name implies, it caters for the interests of all those who like to operate QRP, on any band. One of the nice things about this gang is the Newsletter, which makes no attempt at a "super finish" but concentrates entirely on having lots of meat in the way of articles—the most interesting one this time being the 3.5 MHz band SSB rig, the first SSB rig one has seen written up anywhere for quite a while! And, of course, a useful thing about the QRP Club is that members have lists of back articles from all sorts of publications on matters of interest to the gang; and for an SAE or so, you can obtain reprints of these selected articles.

Mid Sussex is another group with a fine newsletter; they concentrate on a good finish to the job, along with reasonable articles; for example, they have a regular contribution from R o-l Ham by way of propagation data, and this month they are attempting to make clear the use of the colour code as applied to capacitors of the ceramic variety—someone has spent an awful lot of time digging all that information out, and one can imagine a very large number of professional engineers who would like to get their paws on a copy of that article!

Midland find themselves grieving the loss of G5PP, for so long a mainstay in amateur radio activity in the Midlands; our sympathies to his wife in her sad loss. Looking at the meeting situation one is a little confused; there is a meeting at the University of Aston and another at Brashouse Centre, off Broad Street, but we can't be too sure about the dates by extrapolating them out of the January "gen," because we have a feeling that this was a mite different from the normal run. This, we must refer you to the Hon. Sec. at the address in the Panel.

Not so far away is the South Birmingham gang, with their base at Hampstead House, Fairfax Road, West Heath, on the first Wednesday in each month. In addition we see a change of Hon. Sec., which is noted in the panel. As to the subject on February 2, it is Amateur TV, both of the fast-scan and the Slow-Scan varieties.

New Group

Dumfries and Galloway is the name of this new one, and for the moment the venue is Edenbank Hotel, Laurieston, Dumfries, on the first and third Mondays of each month. Already there are as many as 34 members, evenly divided between such as amateurs, SWL's, model-control types and the hard-core home-brewer; and while the first meeting each month is a "social" one for a matter, the latter meeting in each month is devoted to talks and films, or whatever; the list looks pretty firm for the whole of 1977, which augurs well for success, and we hope they will be able to keep up the momentum.

Now to Worcester, who have their room at the Old Pheasant, New Street, Worcester, where they have Monday, February 7, and Saturday, February 19; for the first one the subject is to be Semiconductors, and for the second date the talk will be discussing how RF manages to be propagated around the world.

Back up to GM again, to Lothians, at Riddles Court, Lawnmarket, Edinburgh, where the start is at 7.30; and this is where we hit a problem, in that on February 10, GM4FDU will be talking on projects at George Watson's School—does that mean he is talking at Riddles Court about projects taking place at George Watson's School, or does he do his piece at the school and not at club Hq.? You'd better ask the Hon. Sec.—he should know and his address is in the Panel. As for February 24, no doubt about this one being at Riddles Court, and it is by
GM8DOX, giving a show of commercial equipment.

February 10 is the due date for the Horndean gang, for a film show on electronic timing with motor cars; looking forward to March 10, G6NZ takes the privilege for a show on electronic timing with motor cars; as usual both these dates are at County Control, Civil Defence Hq., Gaol Street, Hereford.

Neachells Cottage, Danescourt Road, Stockwell End, is the venue on the Wolverhampton chaps. They foregather every Monday evening there, alternating between Natter session and more formal activities, such as film shows or talks.

It seems we got it wrong back in December for the Crystal Palace folk, so we must go more warily because February's AGM is on the fourth not the third, Saturday in February. It is however still at Emmanuel Church Hall, Barry Road, London S.E.22.

Stourbridge believe in hiding their programme details well into the Newsletter, presumably to get everyone to read every bit—and, in fairness, it is worth a read, at that. The informal will be on February 1, and the "big" one on February 21, on which date Colin Burton will talk about Test Equipment. As to the venues, the first date is at the "Shrubbery Cottage" in Heath Lane, Oldswinford, while the main do is at Longlands School, Brook Street, Stourbridge.

Gripe

Only a minor one, really, if you change your club's Hon. Sec., please make sure we get the amendment; if not, after a few months someone writes in and asks us "why aren't your records correct?" in a huffy sort of way! The problem is that our crystal ball is of the older, which was originally to have taken place back in December; as usual both these dates are at County Control, Civil Defence Hq., Gaol Street, Hereford.

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 185 Gunnersbury Avenue, Acton, London W3 8LB.

BANGOR: D. Steele, G4FEM, 59 Donaghadee Road (47/3), Newtownards, Northern Ireland.

BOURNEMOUTH/POOLE (Westex A.R.G.): G. D. Cole, G4GHN, 6 St. Anthony's Road, Bournemouth (20027), BH2 6PD.

BROMSGROVE: R. Blacker, G8JKT, 23 Leasowe Road, Rubery, Birmingham B45 9TB.

CORNHILL: S. Halliday, G4EIS, Studio 12, Roswell Terrace, St. Ives, Cornwall.

CRAY VALLEY: M. Tripp, G3YWO, 57 Cathcart Drive, Orpington (3897), Kent.

CRYSTAL PALACE: G. Chir, G4AVV, 24 Patterson Road, Upper Norwood, London SE19 2LD. 

DARTFORD HEATH D/F: Jeannette Mapps, 25 Leybridge Court, Eltham Road, Lee, London S.E.12.

DERBY: F. C. Ward, G4CVM, 5 Uplands Avenue, Littleover, Derby (1931), DE1 7GE.

DUMFRIES & GALLOWAY: C. Rodgers, 5 Elder Avenue, Lincluden, Dumfries.

ECHFELD: R. S. Hewes, G3TDG, 24 Brightside Avenue, Laleham, Staines, Middx, Middlesex.

EXETER: E. G. Wheatcroft, G4CNY, 242 Main Street, Calverton, Notts, NG14 6LR. (Woodborough 3920).


ISLE OF MAN: C. Matthewman, GDSLFA, 20 Terence Avenue, Douglas (22205), Isle of Man.

LEICESTER: J. W. Smith, 2 Eton Close, Knighton Road, Leicester.

LOUTH: R. Bates, GM4BFY, 2 Swan Spring Avenue, Edinburg EH10 6NJ.

MID-SUSSEX: T. Brooker, G3JMB, 20 Farnham Avenue, Hassocks (49663), Sussex.


MILTON KEYNES: D. Stimson, G3THC, 108 Cambridge Street, Woburn, Milton Keynes (316730), MK12 5AH.

NORTHAMPTON: S. J. Purser, G8GHZ, 2 Dobson Close, Great Houghton, Northampton (61794).

NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogston, Hailsham (44239).

PETERBOROUGH: L. Critchley, G3JEE, 36 Waterloo Road, Peterborough, Cambr.

QRP Club: Rev. G. C. Dobbs, G3FUV, 8 Redgates Court, Oldsford Road, Sheffield, S. Yorks.

REIGATE: F. H. Mundy, G3XSZ, 2 Conifer Close, Reigate, (43140), Surrey.


SHEFFIELD: A. Nabb, G4EFZ, 32 Hallemshire Road, Sheffield 10 (30493/).

SHEFFIELD (Association of Clubs): B. Flounders, 24 Birley Park Road, Sheffield, S. Yorks.

SOUTH BIRMINGHAM: Mrs. G. Appleby, G8GMP, 35 Denise Drive, Harborne, Birmingham 17.

SOUTHDOWN: B. Chuter, G8CVC, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex BN20 9JG.

SOUTHGATE: B. Oughton, G4AEZ, 48 Morley Hill, Enfield. STOURBRIDGE: A. Dewbury, G4CLX, 10 Rectory Road, Oldswinford, Stourbridge (3530), West Midlands.

SURREY: A. S. Morley, G4ELA, 15 Conisbee Road, Sevenoaks, Kent.

SUTTON & CHEAM: A. Keech, G4BOX, 26 St. Albans Road, Sutton, Surrey.

STOURBRIDGE: B. Chuter, G8CVC, 15 Coopers Hill, Willingdon, Eastbourne, East Sussex BN20 9JG.

TORBAY: A. Lewis, 26 Clipsham Road, Torquay, Devon.

VERULAM: B. Pickford, G4DUS, 130 The Drive, Rickmansworth, Herts.

WAKEFIELD: R. J. Purser, G8GHZ, 2 Dobson Close, Great Houghton, Northampton (61794).

WOLVERHAMPTON: J. Cook, G3EED, 75 Windmill Lane, Castlecroft, Wolverhampton WV1 3HN.

WORCESTER: D. Cowden, G4DXE, 20 Constance Road, Worcestershire.

feet-and-inches variety, and it does not respond to any requests in metric dimensions! Seriously, though, Torbay have notified us of a change, which will, we hope be correctly reflected in the Panel. As for the Hq., that has not changed, it being still Bath Lane, rear of 94 Belgrave Road, Torquay. February 26 should be an interesting one, when G3UIQ describes how the other half lives, in his talk about a trip to New York.

Northampton are a bit out of sync. with us, the scribe having given us the full details for January instead of February; but since he also says it all happens every Thursday evening, we can safely point you to Spencer Dallington Community Centre, Tintern Avenue, off Gladstone Road, Northampton.

An interesting little snippet of news is that the Reigate club now hold the call G5LK, once the call of Leslie Knight, who was for long a driving force on club life in that part of the world. The main meeting is held these days in the upstairs meeting room of the Constitutional Centre, Warwick Road, Redhill, the date being February 15, when G3NKS is to give part two of his talk on Aerials and Propagation. Earlier, there is the informal natter session in the Marquis of Granby, Hooley Lane, Redhill on February 1, for which you find the saloon bar and enter about 8 p.m.

Over the water we now go, to Bangor in GI-land, where the locals have a booking at the Redcliff Hotel in Bangor on the first Friday each month; we rather gather that February will see GI8HUD doing the second part of his two-part session on Colour TV.

That familiar typeface and letter-head tell us that the next one is Northern Heights; G3MDW covered the January details, but he will be doubtless only too pleased to hear from anyone who wants the current form. As to the venue, this also has been missed out—most unusual for G3MDW to forget that—but never mind we know they have a booking at the Peat Pitts Inn, Ogden, on alternate Wednesdays.

Another Wednesday-using group is at White Rose, who have a place at 83 Town Street, Armley, all to themselves, which has been modified quite extensively to suit a lively club—the only snag being that if the growth rate we hear about goes on, there just won't be enough room for everyone to get in!

A new Hon. Sec. takes over at Wakefield, where the big event is on February 2, when everyone is asked to turn up at the Youth Centre, Ings Road, for a general discussion about reorganising things; incidentally, the usual routine is to assemble there on alternate Tuesdays.

A brief note from the Royal Navy Hon. Sec. gives details of the 1977 highlights, including an Activity Period by the gang at HMS Belfast in April, two stations active during Navy Days, Portsmouth and Plymouth, the Jamboree-on-the-Air, with which they will combine a radio teach-in at HMS Mercury, and the AGM at HMS Mercury—oh, and we forgot the Mobile Rally, also at Mercury; the Hon. Sec., G3JFF would be pleased to send details if anyone cares to drop him a line.

Bromsgrove nearly beat the system by getting their note trapped by a paper-clip in some-one else's report; lucky we spotted it while looking for duplicates! They have a booking at Avoncroft Centre, Bromsgrove, on the second Friday of each month, the start being at 8.0 p.m.

A new country for “Month with the Clubs” comes next, by way of the Isle of Man; they have a place at the Highlander Inn, Crosby, on alternate Mondays, says the Hon. Secretary, who also adds that visitors are most welcome and that he will be pleased to give all the details to anyone, either visitor or prospective member.

The normal routine for Wessex is for them to get together at the Dolphin Hotel, Holdenhurst Road, Bournemouth, on the first and third Fridays of the month; the first session is the “formal and the later one is set aside for the ragshew session. However, for this month only, we suggest you make certain of the dates, as it is noticed that there is a possibility of a change of date from February 4 and G8BPE’s talk on Radio Communications Systems used by Southern Gas Board. For this, contact the Hon. Sec.—see Panel.

Our next stop is Echelford, who have the second Monday and the last Thursday booked at St. Martins
Court, Kingston Crescent, Ashford, Middx. As to the details, we are a bit out of phase with their Newsletter, and so have to refer you to the Hon. Sec.—see Panel—for the latest details.

**Dartford Heath D/F** seems to have completed some sort of a record; the current issue of their Newsletter announces that two of their YL members have just got their own call signs, another YL holds the office of Hon. Sec., and yet another YL was a previous Hon. Sec.! Oh, yes, we also note that, at the top of their “league table” of scoring on various D/F hunts, one of the YL’s is sitting at the joint first with a couple of the OM’s! If you want to know all about this art of direction-finding and hunting for hidden transmitters, the gang have Hq. at the Scout Hut, Broomhill Road, Dartford, Kent; for the rest, either turn up on the second Friday in the month “on spec.” or get in touch with the Hon. Sec.—see Panel.

It’s a long time indeed since last we heard of the gang in Exeter, where they now foregather at the Community Centre, St. Havid’s Hill, Exeter. Reading between the lines a little, we gather that they have some through one of those slacker phases which most clubs tend to get at times, but are now on the rising side of the valley, with a good Hq. and steadily increasing numbers, not to mention a programme that seems to be settled for some six months to come, which is always a good sign. The second Monday it is, and for February the talk appears to be part one of a series on Propagation.

**Southgate** seems to have got themselves a P.R.O., who is a dab hand with a typewriter too; he tells us that they are booked in at the Scout Hut, Wilson Street, Winchmore Hill Green, on the second Thursday in each month; the February topic should be of great interest, it being “Planning Permission”—doubtless with aerials in mind!

We still can’t understand why more clubs do not take up the labour-saving scheme for reporting thought up by Southdown; they have a pre-printed form on which is the Hq. address, names and addresses of officers, the regular routine of meetings, leaving just a tiny bit to fill in giving details of the current lecture or whatever—the Hon. Secretary can fill the thing up more quickly than he can address the envelope, and for us it is a God-send, saving us all the “Sherlock Holmes” stuff!! The lads are to be found at the Victoria Hotel, Latimer Road, on the first Monday of each month, or the second should the first one hit a Bank Holiday; thus, the evening to make for Eastbourne this time is February 7.

**Over to Derby**, who have a newsletter editor actually having to hold material over till next time—he’s the envy of just about every other newsletter editors in the country! From the newsletter we gather that the routine is a weekly meeting on Wednesdays; February 2 for a Surplus Sale, February 9 for a talk on Derbyshire Churches with slides (we guess this is one of their regular YL’s evenings) and on February 16 there is a film show.

The month rounds off nicely on 23rd, with David West talking about Recording. Oh, and don’t forget the AGM, on March 16.

A very brief Newsletter comes in from Surrey, and it tells us that their Hq. is T.S. Terra Nova, Croydon; we also glean by a bit of extrapolation that the date is the first Monday in each month, but for the rest we must refer you to the Hon. Sec.—see Panel.

Friday February 18 is the date if you want to look in on the Peterborough Radio & Electronics Society at their place in the Scout Hut, Occupation Road; the subject was still to be finalised at the time of their letter.

Brrr! Milton Keynes on February 14 will not only have a cold journey to the Hq., but they will also be hearing from G8LFB, and his subject will be “Ben Nevis in Winter.” The Hq. address is Lovat Hall, Newport Pagnell; and if you are a stranger to the area, get in touch with the Hon. Sec., and he will send you a map.

The letters WAMRAC translate into World Association of Methodist Radio Amateurs and Clubs, which give a pretty fair indication of the aims and objects of the group; they have a worldwide membership, and of recent years it has been open to those of any denomination to become members. All the details can be obtained by dropping a line to the Hon. Sec. at the address in the Panel.

Acton, Brentford & Chiswick will be hearing G4FBK giving his Introduction to VHF and UHF on February 15, at the usual venue which is Chiswick Trades and Social Club, 66 High Road, Chiswick, London W.4.

Up in Sheffield the clubs have banded together to form the Sheffield Association of Clubs, the idea being in essence that with the members of about five local groups all in one place and at one time, it becomes possible to have some rather special speakers. To run down the various gangs involved, there are the University and the Polytechnic clubs, who have a get-together of both on Thursdays at the Phoenix club, Charles Street, the Sheffield club proper, with Hq. at Sheaf House Hotel, Bramall Lane on the third Monday, and Worksop, Thursdays at the Anchor Inn.

On to Leicester where the AGM was on January 17; so we can hardly expect much programme data until the committee have had a think about it, so we refer you for all the details to the Hon. Sec. that was (and maybe is!), at the address in the Panel.

**DEADLINE—and Change of Address**

For the moment, it is asked that, instead of the normal arrangements, the Clubs mail should be addressed to: CLUB SECRETARY, SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS., AL6 9EQ. This will help your Club Secretary no end; and as for the deadline, it will be to arrive, first post on February 9, please.

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March issue will appear on Friday, February 25th.
THIRTY-FIRST ANNUAL MCC
HAPPENINGS — RESULTS
— COMMENTS

MCC in December!—never let this happen again, on pain of instant death! Thus, one club summarised its feeling about the "new" date in December, and one gets the general feeling that a reversion to November in future would have general approval.

However, let's look, not at the future, but at the 1976 contest. There were, of course, several invigilators, and the consensus of their opinion is that there were about fifty stations taking part; the operating was as usual very good overall, but it is noticeable that the speed of sending in MCC is far higher than it is in, say, one of the big world-wide contests, and this occasionally leads to funny log entries when an invigilator compares what he wrote down with what appeared in the logs of the two stations concerned. All fair enough, since MCC is traditionally the place where likely lads are allowed to get experience before they take part in the bigger affairs; and this is the very reason for us not making any firm attempt to specify what abbreviation should be used for any particular county—this way the chap at the receiving end must read the stuff and get it down right. It is OK by us if you want to use a "standard" three-letter abbreviation for your county, but equally fair if you could think up another one, especially if it had the additional merit of wit! But, in the end, we must say that a distressingly large number of stations were sending too fast for their own ability to receive.

Signals; in general, they were very good, although quite a few people managed to generate dirty signals from transceivers, and one poor soul lost many contacts because, although he could be heard, his signal was wandering up and down in frequency to the point where it was all but impossible to hold him unless one opened the receiver selectivity wider than wide. One invigilator spent nearly ten minutes following him around, and with audio filter the situation was that one could not expect more than half a letter to be in the pass-band; so everyone this particular chap worked had a struggle. And yet—everyone was giving the guy a T9 report!

Giving a chap T9 in a contest, when he has a dirty signal is considered, at least in some clubs, the "right" thing to do—why, for Pete's sake? Surely, if the chap is anything of an operator he will realise that he has a problem, and stop to sort it out—with a transceiver the problem may be no more than a rather high drive level setting, and indeed several stations were noted to occasionally produce a rough signal after a retune, but to clear up again almost immediately.

Who was about? Well, on both evenings, there was a CQ VK call being made smack in the middle of the most populous bit of the band; and when your scribe went down for a look at the appropriate frequency, there was a signal replying. On the other hand, while the GM's were out in force this year, one has to say that there were for some reasons, apparently no club GW activity, nor much GI stuff. However, the Europeans were about, GD, and GC, not forgetting EI where IRTS, despite the date clashing with their Annual Regional Social evening, were out in force—indeed there was a little private battle going on between EI2BB and EI9ONE, and there were other EI's noted in the logs. GC was represented in several logs by GC3TMA/P in Alderney, and OH, OK and OL featured in just about all the leading logs. One was a little entertained to notice that the runner-up didn't even give the third-placer the status of a club in his log—that's one-upmanship for you!

Of course there were the little crises here and there, of which more will appear in the log extracts; but one of your invigilators was reminded of his duty the day before the contest, and recalled that, although he had gear for the band, he hadn't used it for upwards of a twelvemonth, the receiver half having been purloined for service as the tunable IF of a two-metre converter. No sweat, thinks he, it's only a matter of chopping a couple of coax plugs from one place to another and tuning-up the ATU—save that he had forgotten doing an ATU rebuild and that he didn't know whether it would tune Top Band—it wouldn't, of course! Luckily, there is one of the Joynothes signal almost as strong as Maidstone which puts it into the receiver-blocking class, at at least one invigilator's station.

Comments

As usual, a fine selection, from the sour to the plain hilarious. For example: "Nice to see some new fists around, and, also, the old lags!" (IRTS "B") . . . "December is too late in the year; we would like to see the contest held once more in November" (Dundee) . . . "Surprising how many people didn't know what county they live in." (Maidstone Y) . . . "Half-wave dipole over a marsh—it was a sportsfield before the rain started; the whole issue was paddled by G3ORH, G3VTT and G3ZSU, and brass pounded by G3WXM." (Maidstone Y) . . . "Plagued by timebase interference, which made copy of the weak stations difficult. Could have done with more stations on." (Surrey) . . . "Our first entry for some years. Enjoyable as always." (Leicester Polytechnic) . . . "Worked more QSO's despite losing two hours to the Region One Annual Dinner-Dance—our Social Affairs committee member is on his last chance!" (IRTS "A") . . . "CUAGN NEXT YEAR" (Greater Peterborough) . . . "Think you require more early publicity for the event." (White Rose) . . . "One member thought he heard a ZC4 station!" (Worcester) . . . "Very interesting contest; have just learned that my electric toaster radiates on Top Band as well as the FT101. Couldn't you organise an electric-toaster Top Band contest?" (Verulam) . . . "Very good overall, but were a bit down on the Sunday evening, or at least your conductor thought so. However, on both evenings the GM's were booming through right from the start, with the Glenrothes signal almost as strong as Maidstone which puts it into the receiver-blocking class, at least one invigilator's station. Conditions didn't seem to be too bad on the Saturday, but were a bit down on the Sunday evening, or at least your conductor thought so. However, on both evenings the GM's were booming through right from the start, with the Glenrothes signal almost as strong as Maidstone which puts it into the receiver-blocking class, at least one invigilator's station.
“Only a check-log this time; hope it’ll be a proper entry next time.” G4BUO, Gravesend.

The Logs

Definitely above average in presentation this year since last your scribe wrote an MCC report several years ago. As to their time of arrival, late or otherwise, a combination of circumstances arose which meant that the logs effectively landed in two lumps on your reporter’s doormat, the second lot having perforce taken a rather unusual route and being delayed in delivery by the Christmas postal break. In the latter there was one log which apologised for its lateness; but, since we couldn’t say how many of the rest might have been a post late, we felt it unfair to penalise a group who had been honest about their failing.

RESULTS

THE 31st ANNUAL MCC

Positions and scoring

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A check log is also acknowledged from G4BUO.

Equipment

The once-ubiquitous HRO has all but disappeared in favour of transceivers of one sort and another; the advantage of “no netting” probably being the main reason for transceive operation; and the key-controlled change-over, while in no sense approaching true break-in, did at least allow lots of operators to “kid themselves” and save a few valuable seconds by using the BK signal.

And, one invigilator felt, there were the odd one or two with a full break-in system and definitely listening-through.

Aerials

Here is where one can see the differences, the more so when one takes a look at the map. Both Lothians and Dundee were using aerials at 140-150 feet high, and all the stations who scored 13000 or better had half-waves, all but one of these being in the dipole configuration, Shirehampton being the exception; they also do not say anything about the height of their aerials. I.R.T.S. “B” and Maidstone YMCA both had their dipoles up at 6/70 feet. On the other hand, the answer was not “all” in the aerials, by a long sight, there being back-markers with good aerials, and people near the top with comparatively indifferent ones.

The Future

Over the past ten years there has been a steady diminution of the overall level of Top Band activity; the result, one feels, of the growth of the UHF TV service, and the resulting relative freedom to operate at HF after DX, and possibly also the wide-spread availability of VHF equipment, making 144 MHz the common ground between A and B licensees. Be that as it may, the drop in MCC entries over the same period is nothing like as heavy, and that being the case, MCC as an activity is part of the “use or lose” philosophy which we must all stick to until our new allocations are finally settled at the next conference. Thus it follows that there must be an MCC in 1977, come what may; and in view of the general preference for a November contest we will here and now say that MCC will be on the weekend of November 5/6, 1977.

As to the Rules, we will consider them in the light of all the circumstances, and we will give you any changes of Rules in plenty of time. Meantime, keep up the activity on Top Band!

THE NEW QTH PAGE

This space is for the publication of the addresses of holders of new call signs, or changes of address, in EI, G, GC, GD, GI, GM and GW of stations not already listed. All addresses published here will appear in the U.K. section of the American “CALL BOOK” in preparation. Please write clearly and address on a separate slip to QTH Section. Be sure to give County designation and post-MM Section. Be sure to give correct County designation and post-code. In the case of direct subscribers needing Change of Address, please state for card index adjustment. Address items for this space to: “New QTH Page,” SHORT WAVE MAGAZINE, 34 HIGH STREET, WELWYN, HERTS. AL6 9EQ.
俱乐部 PAOZV 有一个长期的疾病，23 cm beacon 通过信件 PAOJY 确认，该问题已经得到了满意的解决。俱乐部上个月提到的奖项仍然未出现。今年的电子设备是 10-120 GHz，由于持续风向和风速的影响，Yagi 天线被吹离了方向。工作正在进行，但这需要更多的时间。

G3JHM（Four Marks, Hants）告诉你的信使，他听说的 GB3LBH beacon 采样率 10-1 GHz 从 Tatsfield 地区在 15 dB 电平。Ken 已经重新设计了设备并进展良好。它将辐射 90°带宽。高质量的音质早已经从 Chelsfield 和 Alderney beacon。

Roger Thorn, G3CHN（Devon）已经解释了为什么 Lannion beacon F3THF，被 YL13d。Contests

今年的活动是 144 MHz 开放竞赛，5月5/6。请发送你的报告，到 70 MHz CW 月刊 23 号。

Repeaters

虽然从 5月，中央苏格兰 FM 组策划的 repeater GB3CS 的设备没有出现。根据可靠的信息，设备已经成熟，很可能需要重新设计并重新安装。通过这种方式，一个感兴趣的会议应当及时举行。

Three Band Annual VHF Table

Final Placings, December 1976

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formulate a constitution for the group and to get the show on the road again in a properly organised way.

It has always been a condition of all amateur licences that an operator listens on the frequency he proposes to use, before transmitting. Now that the new licences are in force, it is understood that the Post Office engineers concerned with station inspection will expect this practice to be adopted, particularly where repeaters are concerned. This means that one must have facilities for listening on the input channel, either within the equipment itself or on a separate receiver. This will be no embarrassment to those with the more comprehensive transceivers, but those using more basic, hand-held sets may not be able to comply with this requirement.

A New UHF Band?
The United States administration concerned with radio matters has proposed that a new UHF amateur band be established from 902-938 MHz. At this stage, the proposal is merely for discussion as a step to final approach to frequency allocations at the 1979 WARC in Geneva. This new band would be additional to the present VHF/UHF bands which it suggests be retained as now, on a world wide basis. A less welcome proposal for American amateurs is that part of the 220 MHz band be allocated for Citizens' Band use.

Satellite News
At a meeting in Guildford on Nov. 20 last, the Committee of the AMSAT-UK group carried out some re-organisation of its functions. G3IOR remains as chairman, the new treasurer/secretary being James Keeler, G4EZN, to whom inquiries about membership should be addressed. G8KME has been appointed Librarian and G3RLW will handle technical queries. New arrangements are being worked out for the editing, printing and distribution of the publication Oscar News. Club secretaries considering lecture programmes might care to note that AMSAT-UK can provide speakers. Inquiries should go to G3COJ.

Following the cancellation of the last ITOS mission in June, it appears that Oscar 8 will be launched with LANDSAT C next September. This would put it in an orbit only 800-900 kms. high with a correspondingly reduced communication range of shorter maximum pass. However, the orbit time would be quicker.

The 1977 Orbital Predictions calendar for Oscar 6 and Oscar 7 compiled by Skip Reymann, W6PAJ, is now available from G3IOR (QTHR) price £1.50 to AMSAT members and £3.00 to non-members; send a minimum size s.a.e. 9in. x 11½in. with 9p stamp. This calendar gives details of every 0-7 and 0-7 orbit for the whole year, plus operating schedules and frequencies.

One of the NiCad cells in the 0-6 battery pack has died. Even so, the signals relayed on 10m. are still very good, even though the passband is somewhat narrower. The 10m. signals from 0-7 are still functioning then. The next coincidental equatorial crossing will occur on August 16.

The 10m. signals from 0-7 are frequently rather weak. Sometimes the 5D TLM channel reads 556 suggesting that the attenuator pad is switched in. It if reads 552 or less, then it is some 15 dB more sensitive.

It should be obvious that the Amateur Satellite programme is expensive and AMSAT-USA is seeking to raise 10000 dollars towards the cost of future satellites.
Accordingly, it is suggesting that members might wish to donate ten dollars to buy a solar cell to be “registered” in their name. Perhaps regular British users would like to donate the equivalent amount to AMSAT-UK via treasurer G4EZN. After all, as with repeaters, those who use the satellites ought to assist with the cost.

**Meteor Scatter**

There has been insufficient time for written reports on the activities in the recent Quadrantids shower but G3POI (Downe, Kent) told your scribe that he completed an SSB QSO with 11BEP in DE square in 45 minutes. From UK3EDB (GH07c) Clive got just one ping in 35 mins. whilst the sked with UW3YS (RN42c) was QRMed by UR2RX. The long shot, 2880 kms. sked with UW6MA (TH69c) did not come off.

Keith Naylor, G8FU (Essex) has added nine new squares to his leading 2m. total, all by MS, namely HJ, HS, II, IW, JJ, KI, KN, KZ and NU. Compared with previous years, he found the Geminids in December to have been rather poor with only bursts of marginal strength from most stations. At G3FPK, many stations were heard on CW and some on SSB conducting MS skeds in the Geminids and Quadrantids. Perhaps some of those operators would let us know how they faired? From GB2RS, it was learned that over a 15 hours period on Jan. 3, 25000 pings were recorded from Radio Gdansk in the 4m. band.

**Four Metres**

Due to the long Christmas break, postal delays, etc., there are not many reports this time. G3BOC (Shrewsbury) and GM4CX (Borders) added a few new counties between them but lack of activity plus poor conditions seem to have contributed to the lack of enthusiasm for the band.

**Two Metres**

Is it too much to hope that, with the beginning of a new year, more sensible use of the lower end of the 2m. band be made? Firstly, it seems pertinent to mention that 144-20 MHz is the random MS calling frequency so should not be used for QSO’s via other modes. Likewise, the CW random MS calling frequency is 144-10 MHz. The SSB calling frequency of 144-30 MHz seems to be the tuning up frequency at times with the interminable whistles and gargling noises masking the weaker stations calling “CQ.” Perhaps when the next band plan is drawn up, a “garbage frequency” should be designated whereon all would hoot away to their hearts’ content!

Secondly, it is difficult to understand why, once contact has been established on 144-30 MHz, stations do not immediately QSY well away from it. Many folk merely go “ten up” or “ten down.” Why not 120 kHz up or down if your equipment is capable? This ties in with the third point concerning the 144-30-30-144-50 MHz section, which is SSB under the 1975 Warsaw plan. With well over half the band available under the plan for FM mode, there is no longer any excuse for FM stations to occupy this section of the band, nor, for that matter, AM stations. Lastly, how about some more honest reporting? Such as, “You are five-and-nine plus but rather distorted and 40 kHz wide, OM.” Recently a few really rotten signals have appeared on the SSB end of 2m. Some are spitchy and very wide although the speech has a real bite to it when tuned in on the nose. Others are so distorted as to be readability four or worse and sound as if the operator has a peg over his nose or is being throttled! Unless one tells these people about their rotten signals, they will likely never know, for this trouble just does not show up on meters. These “throttled” signals are usually as wide as a barn door even when not all that loud. Finally, to illustrate what a properly adjusted, but really strong signal should sound like, listen to G8GGK or G8HAL if you receive London stations well. If they seem wide, then you have a lousy receiver.

Not much correspondence is received from SWL’s by this column so it was a pleasure to get a letter from Glen Seeeney of Nottingham, a keen 2m. addict aged 14. He lives next door but one to G8HVK and near a good radio shop run by G8CMT. Present RX set-up is an Edystone 840C and Microwave Modules converter with an indoor dipole on which Glen has heard FIANH in Normandy recently.

G3BOC (Shrewsbury) informs that his trip to Brora in YS square last October was fruitless and Harry missed the Aurora on the 31st. From the London area, conditions have been mediocre for much of the month, most of the longer distance QSO’s being subject to very deep QSB. On Dec. 23 there was a lift to the east and people were working.

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<tr>
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ON's, PA's and DL's. East is the worst direction from G3FPK and only a couple of DL's were worked in DL square, on the key. EI9Q (WM65d) is usually on around 144-2 MHz from 1000 Sunday mornings and was contacted on CW on Jan. 2 for the first EI of 1977. The band was again open to the east on Jan. 4 with more PA, ON and DL stations being worked by the better sited operators. The very high pressure area was in the wrong place for any spectacular lift; the highest reading recorded in London being 1043 mB, corrected to sea level.

G8BKR (Bristol) reckons that 1976 was a good year and John managed to work most of the DX with his TS-700 apart from some E's gotaways.

### Seventy Centimetres

Peter Burden, G3UBX, (Wolverhampton) writes that he has worked 206 different stations in 61 counties and 10 countries on 70 cms. in 1976, almost exclusively on SSB, with a little FM, and CW when necessary. Due to his portable activities, some "easy" counties have been missed. Peter's gear comprises a Yaesu FTdx560, a Datong processor, Microwave Modules transverter with BFR90 pre-amp. and a 2C39A amplifier delivering 45 watts p.e.p. The aerial is an 88-ele. Multi-beam at 21m. Audio on the RIT varactor provides an FM facility on the HF transceiver. For portable and -/A operation, he uses a pair of 18-ele.

all the activity is concentrated around the 432-2 MHz SSB and 433-2 MHz FM calling frequencies, plus the repeaters. He points out what excellent results can be achieved with just 10 watts to an 18-ele.

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</table>

**70 CENTIMETRE ANNUAL TABLE**

Final Placings at December 31, 1976

Parabeams or a 46-ele. Multi-beam

Peter feels it unfortunate that most Parabeam at 12m. and hopes that many more amateurs will try the band this year.

Ned Cartwright, G4DKR, (Ipswich) found the Cumulatives good fun and was encouraged to hear so many stations on. He heard G3VPK at Chelmsford working DX he couldn't even detect, though.

### Square Hunters' Corner

Via GM8FFX, comes news that DB1XI has permission from Shell Oil to operate from an oil platform in the Brent Field in AT square. The British call is GM5MCJ and the rig a TS-700 with 100 watts amplifier to a Yagi 200m. a.s.l. on the helicopter platform. Operation should be at two week intervals for a long time as soon as Home Office matters are concluded.

**Deadlines**

Some relevant photographs for this feature would be welcomed. Sharp, glossy black-and-white efforts, please, along with your news, views and claims. This time everything to: "VHF Bands," SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts., AL6 9EQ, by Feb. 4 for the March issue and March 4 for the April edition. 73 de G3FPK.

### PHOTOGRAPHS ALWAYS WANTED

Readers are reminded that we are always glad to have good photographs of Amateur Radio interest for general illustration in SHORT WAVE MAGAZINE. Though colour prints can sometimes be satisfactorily reproduced black-and-white, we much prefer the latter in the original. Except that we cannot conveniently make use of photographs that are either very small or very large, size is not of great importance as this is in any case determined to our requirements in the block-making process. What is important is that the picture should be clear and sharp with fully descriptive notes—and this description should not be written on the back of the print itself, but on a separate piece of paper lightly attached to the photograph. Payment is made for all pictures used, immediately on publication.

Send to: Editorial Dept., SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ
COMPONENT SUBSTITUTION

SOME GENERAL THOUGHTS

It is a very rare home-brewer of amateur-radio gear who has not faced at some time or another the need for a substitute for a called-for component; either he can't get the prescribed item from new, or, if he is a dyed-in-the-wool amateur, because there just isn't the desired object in the junk-box. The writer has for many years faced almost daily requests to offer substitutes for the specified item, made by buyers, for equipment which will be built on the shop-floor and must be O.K. when they arrive in the Test area; and it is axiomatic (from Murphy's Law) that at the time the request is made there is either an equipment available in which to try the substitution but not enough time, or, alternatively, that there is enough time to run trials but no equipment to run them on. Thus, he has accumulated—the hard way!—some considerable experience of what is "or" and what is not, which he offers for consideration.

Firstly, then let us look at the sort of substitutions that are often required by amateurs, and where the trick is easy; also the areas where one needs to gang warily.

Mechanical items are largely a matter of common sense; if the article specifies, for instance, an Eddystone drive for a capacitor, and all you have is a Japanese slow-motion dial with numbers round the periphery of the knob, clearly you have to change the mechanical layout, drill the holes as accurately as may be, and, instead of calibrating the dial directly in frequency with a mapping-pen and Indian ink, one must make a calibration graph showing frequency against the numbers on the dial—and the resulting drive, while tolerable will not have that silky feel one associates with the Eddystone device.

If the question is one of electronic components, the situation immediately divides into groups: passive components such as resistors and capacitors, wound components such as coils, chokes, and transformers, and active devices, which in turn break down into valves, transistors, and integrated-circuits.

Taking the first group, the top of the list is resistors. These can be divided into carbon types, metal-oxide, metal film, and wire-wound among the fixed resistors, while the "pots" may be carbon-track, wire-wound or cermet, single or multiple turn, and having either a linear, a logarithmic, or a special "law."

For many years, the carbon resistor had complete domination in the small sizes used in electronic work, usually at twenty per cent tolerance, in either 1/2, 1 or two watt ratings; carbon compo for normal use and "high-stability" for special places. Frankly, these types should be regarded as obsolete, and only used in places where a drift in resistance with time is quite tolerable—certainly never in the front-end of a receiver or converter, where the noise generated by them may prove to be the limiting factor to sensitivity. It should be noted with these types that the values shown on these components is the "selection tolerance" and is no guarantee that the component will still be within tolerance by the time you come to use it. In general, carbon types tend to drift higher with life, and to change value after a little use; with temperature rise, the resistance tends to fall, unlike metallic materials.

In general, these resistors may be replaced by metal-oxide types between 10 ohms and about one megohm, usually to DEF 5115, Style RF; and here we immediately come up against a marked change in the philosophy—these specifications are "triple-rated." For example a resistor might be classified as being one watt general purpose, half watt high stability, and quarter-watt semi-precision at one and the same time; thus the same component serves three different purposes, to the great relief of the storeman! Additionally, the metal-oxide types are made to five per cent, two per cent, or one per cent tolerance; this by intent not selection, so that the price of each tolerance is the same. The company for which the writer works has standardised on using two per cent types across the board, thus saving the storage space for all the five per cent requirements at a stroke; and "specials" of one per cent are only called for as required. On the other hand, the Navy standardises on one per cent type resistors for all maintenance purposes, regardless of whether the originally fitted component was any higher tolerance. Thus we can explain Rule Number One, which is that a component may always be replaced by one of the same type and closer tolerance of the same nominal value. Thus, in the ship's stores, one type of resistor is now used for replacing maybe twenty different types previously required. The metal-oxide types come from 1/4 watt to seven watts dissipation ratings.

Metal film, in fixed resistors, is a term generally taken to refer to a different type to the "thick film" or cermet type of which more anon. In general, the metal film will be an acceptable substitute for metal oxide, and possesses the useful facility of covering a wider range of values, being obtainable from below an ohm to well into the megohm range; however, it is normally only given a single rating. Both metal-film and metal-oxide types of resistor are far better as regards stability both with temperature and time, than any of the older carbon types; up to ten times better with temperature, or even better in some cases.

Wirewound fixed resistors should never, even, be used at RF; they serve only for high-dissipation applications in DC power supplies, such as bleeder resistors. One only exception to this rule is known to the writer; a linear amplifier using four TV sweep-tubes in parallel has been known to use a wire-wound resistor as a sort of lossy RF choke with tolerable results. As to the ratings, it should be noted that wire-wound resistors should be run to dissipate power as near to their rating as may be convenient, because if a wire-wound component carries a very low wattage, the wire will warm up but not heat the former to any extent, so that if there are any air bubbles in the vitreous enamel coating, there may be a place where the wire is not touching either enamel or former, and can therefore get hot and go open-circuit. This would not happen were the resistor dissipating a fair wattage.

Potentiometers

There are, for practical purposes, three materials, carbon, wire, and cermet. Carbon is the traditional stuff for volume controls and similar applications; it should never be allowed to draw current through the slider, or it will go noisy and/or fail completely at a moments
notice! This material is used with either a “linear taper” or a “log law”—the first one is so made that if you plot degrees rotation against resistance you get a straight line graph on linear graph-paper. Such might be useful for, for example, a voltage-setting pot in a PSU. The log law comes into its own where the application is connected with the faculty of hearing, since hearing is, in terms of loudness, a logarithmic function. Thus a log pot used as a volume control gives a nice even control of the loudness—if one put a linear one in by mistake, the control would be “all at one end.”

Wirewound pots are the traditional materials for applications where power is going to be dissipated and current taken off the slider. In the big ‘uns it still holds sway, but cermet is a useful—indeed probably a better—alternative. Perhaps the main thing that separates them is the question of “resolution.” Clearly, the slider of a wire-wound pot makes its smallest move when it moves from one turn of wire to the next one in either direction; thus, in effect, it moves in small steps. On the other hand the cermet pot has no steps as such, and so we can say it has much better resolution. That alone may be every justification for changing from wirewound to cermet! And, of course, pots aren’t always the ones on the front panel, either—the ones on the board may be any of the three materials mentioned, and may be of one turn or a multiple turn device, often tagged a “trimpot” although that title is a trade name.

**Capacitors**

This is where the going gets a bit interesting! Our various capacitors can be of electrolytic, paper, plastic foil, ceramic, and mica as the main variants. Let’s look at the electrolytics first. They need to “see” the right polarity—if you want to smell a vile stench try wiring an electrolytic with its negative end to the positive of the supply volts, and its positive to supply negative. Just switch on, and reach for a gas-mask! Enough said about *that*. Of the electrolytics, there are the “ordinary” ones, similar ones but a bit better and glorifying in the appellation “computer-grade,” for use on power supplies of one sort and another, low-voltage ones of the “ordinary” breed for decoupling (and coupling, too, in transistor equipment) as well as the “tantalum” ones which have a better life expectation, particularly if the gear is only going to be switched on once in a blue moon. Apart from the tantalum types, all the others should be “formed” again very so often, by putting them, in series with a ten-thousand ohms resistor, across a supply of the right polarity and capable of being taken up to the voltage rating of the capacitor; once there it can be “stewed” for an hour or so until the leakage current is minimal.

If you are going to replace an electrolytic, make sure you put it in the right way round circuit-wise; it is easy enough to do this on power supplies, but if it happens to be a low-voltage one coupling a couple of transistors together in a “clever” bit of circuit, even a professional development engineer would be scratching his head as to which is the right way round. Thus, it is *essential* in such a case to make sure which end of the one you take out is which, and *make a note of it*. If the electrolytic is anywhere in a power supply for a transmitter, put a ten thousand or so pf capacitor across it so as to decouple the circuit to RF—the electrolytic does not look at all like a capacitor above about a few hundred kilohertz, depending on its value and rating.

Paper capacitors are to be found all over the place in older equipment; and the chances are good that they’ll nearly all be a bit leaky, too! Paper ones are not too common in new equipments nowadays, their places having been taken by plastic-foil types of one sort and another. This is O.K. usually because the paper ones were usually decoupling at lowish RF or coupling at audio; and any change will probably be for the better anyway!

Now we come to the truly RF types, namely mica and ceramic. This is where you have got to be CAREFUL. Let’s look at the ceramics first. There are two definite types, one for use in non-critical applications such as decoupling, where the object of the exercise has been, essentially, to get as much C into as small a space as possible for a given voltage rating; and the other is for more “clever” purposes, for which the dielectric will have a specified temperature coefficient, which may be negative with increase of temperature, positive ditto, or as near as dammit zero. However, these are not the only parameters, insofar as size-and-shape vary between manufacturers, and the voltage ratings vary. In addition, one has to decide whether one needs the leads to come out axially or stick out sideways! Thus, by far and away the best thing you can do is to drag out the equipment handbook, find out what the recommended spare is, and buy it from the equipment maker. Obviously, you won’t be changing it if it’s a good ‘un, so you can’t run a series of tests to find out what it does with temperature and hence to find out what dielectric is being used. If that can’t be done, you may well find that by just fitting whatever is to hand in the line of ceramic capacitors, the gear will work—but whether it will still be capable of working within its specification limits over the whole temperature range for which it is designed is going to be a moot point. However, the amateur in such a situation can console himself with the thought that if it works within his requirements and within his temperature range, that’s good enough! If it *isn’t* then about all you can do is to make note of which dielectric was in the capacitor you first tried, what the effect of it is, and try and find one of more suitable dielectric material.

If all this sound a bit complicated and unnecessary, the writer suggests you get hold of a 1973 Erie catalogue, (which should be easy because lots of people are tossing them out in favour of the latest, 1976, edition!) or a more recent one, and scan through it carefully, particularly paying attention to the various sets of curves for this and that dielectric material.

Next, mica. Mica is a naturally occurring material, and so its parameters tend to vary a bit; but that is the maker’s problem! Basically, the amateur application is essentially summed up as: everywhere the capacitor has to carry currents of sizeable magnitudes. For example, the capacitor joining the end of your pi-tank in the rig to the PA anode; this should always be mica, preferably of the type where the capacitor is encapsulated in epoxy resin rather than in the cheaper “digestive biscuit” coating or plain wax—the digestive biscuit material has a tendency to be porous, so if you must use it, examine the capacitor under a glass to see if its coating is not
full of pinholes, while the wax just melts and flows away to the bottom of the cabinet, leaving the capacitor all naked and unadorned. Mica capacitors do not like this and promptly let the damp in from the atmosphere, so the next time you switch the rig on—"Proof!"—and you are QRT again.

One type we have not mentioned specifically is the polystyrene; these come in close tolerances and look (and are) just like the general run of plastic-foil capacitors. However, they have the endearing trait of behaving almost exactly oppositely to the ferrites with temperature; so if you want a tuned circuit using a ferrite pot and a C to "stay put" under all conditions of temperature, then the C will usually be polystyrene, or maybe an equally carefully-selected ceramic. However, beware of polystyrene and plastic capacitors in which you can see the construction—this sort are very useful, but it is awfully easy to pull the leads away from their anchorage, which gives you a disconnected capacitor which looks O.K.

Inductors

Again there are, basically, three types. First, of course, come the air-wound variety used in receivers, transmitter tanks, and similar purposes. These don't normally "blow up" so much as get sat on when the equipment cover is off! Then we have the ferrite-cored variety, such as, for example the well-known 88mH toroids, and the third general classification is the iron-cored laminated type used at audio and mains frequency.

To deal with the first variety requires a show of ingenuity more than anything. If it is to be fixed-tuned (as, for example, a converter front-end), then get as much information as you can about the problem by carefully looking at the wreckage of the old one and the circuit diagram. For example, let's imagine we have just wrecked the aerial coil of a converter. We can see how far up the wire the input tapping from the aerial lies—if it's ½ of the way from the earthy end of the coil when straightened out, it's a fair guess that ½ of the way up from the ground point of the new coil will be about right. There will be a trimmer capacitor shown connected across the coil, or a fixed C and the coil had a slug in it; note the value of a fixed C, and/or remove the trimmer and measure it's capacitance at the setting it had before you lifted it out. Now, all you have to do is reach for your trusty GDO, wind a coil and away you go. The coil should resonate with the appropriate value of C connected across it, and with the slug half-way in to the coil turns, to ensure a bit of leeway for adjustment.

Ferrite pot cores and toroids have the characteristic of having virtually no external field, so the use of a GDO is completely out. Also, different ferrites are of use over differing frequency ranges, and the ferrites offered by different makers do not always have the same characteristic. However, your circuit diagram doubtless shows the inductance in the Table of Values, and you—we hope—know roughly the frequency at which the thing is going to be used. From this, you can find as many ferrites as you can in the junk box and select one from these on which to start the new design; or you can get the maker's data sheets and catalogue, and decide on a suitable material and a suitable size, when a little calculation will show how many turns of what wire gauge (incidentally, "winding wire" as it is called, is almost 100% metric nowadays, so don't waste time doing sums on S.W.G. sizes unless you've actually got some!) should be wound on the former. But, this writer would say, very definitely, don't try it unless you are "in extremis" if only because you won't know the Q for which the original was designed; so you will have to aim for the very highest possible Q by choice of wire and ferrite, only to have to lose some of it by damping the beast down to give the correct performance in the circuit.

Finally, in the way of inductors, we come to the laminated iron-core chokes and transformers. Here, the eye is as good a guide as any. If the outputs are the desired values, and the inputs likewise, and the size is the same as the original—particularly as regards the amount of laminated iron present—then it is worth trying at the very least. And it wouldn't be the first time that a mains transformer has been made to do duty as a modulation transformer, at that!

However, while the same arguments can reasonably be applied to smoothing chokes, it must be realised that any attempt to measure the inductance will be misleading in that the value of L falls the moment a direct current is passed through it, be the "iron" just that, laminations, or even ferrites.

Active Devices

These include valves, semiconductor devices and IC's. In general, a valve of a specified type number can be changed to one of another manufacturer bearing the same number, or indeed any valve which is quoted in the valve data books as being an equivalent. However, one may find a need for selection of valves from a batch, regardless of maker in some cases. For example, one thinks of the VFO of a certain transceiver—if it goes "drifty" keep on changing VFO valves until you come to the best of the bunch, and use that one. Double triodes used in simple valve-voltmeter circuits often need selection to get a valve which will allow the meter to be zeroed. A good tip with such types as these is to "age" them by running them continuously for a few days and then rechecking that the circuit will still zero properly.

Transistors need watching. Preferably replace with another one of the same type and by the same maker, and, at least with germanium devices, be ready to have to alter the values of resistors to some slight extent due to changes in the technology since the original was made. Turning to silicon transistors, the advent of the planar epitaxial methods resulted in a rapid swing up from low frequencies straight up to UHF and beyond. This is a matter of some importance, as one may find what looks to be a "good" substitute for a dud transistor or one you can't get turns out to be wildly unstable. Usually this is because the original device had a relatively low maximum frequency and the new one shows significant gain right up into the gigahertz region—which can be a darned nuisance if you are trying to make a repair to a Top Band D/F receiver! Even specimens bearing the same type number by different manufacturers may be wildly different. Take the ubiquitous 2N3055 power
transistor; while they all meet the published parameters of a 2N3055, the unpublished parameters vary enormously; and, for example, the low value for FT quoted in the spec. for the 2N3055 may be well beaten by some devices from particular makers, whose output of 2N3055's can happily be used as PA stages on Top Band! In case the significance of this escapes you, recall that electrolytic capacitors don't look like capacitors any more when high frequencies are in question; thus you may find that one of these "Top Band PA" types will go frantic when it is soldered into a previously quite tame power-supply! It is of interest in this connection to notice that often "dud" power transistors, if opened up and examined with a high-power glass, prove to be still workable, the failure being of the lead coming from the chip to the output pin having fused through an overload.

Warning

It should be noted that some transistor types have Beryllium Oxide in their make-up; if you have one or more such, don't open them up, and don't just ditch 'em into the bin if you "pop" one. If you have any "professional" friends, they may be able to take them, but if not, they may be returned to the makers, clearly labelled for what they are and what is wrong with them. The manufacturers have facilities for dealing with them. Just recall that this stuff is highly toxic, so make sure you have the position of any such devices clearly marked on your gear, and know just what to do with them, should they fail.

Integrated Circuits

As far as TTL is concerned, almost anybody's TTL device will swap with the equivalent from another maker; and RTL and DTL are obsolete anyway. As far as MOS IC's go, the question of whether they will interchange with another maker's device is secondary to the prime one of getting it soldered in without blowing it up and the same goes for the majority of FET's, too. To use a brass plate on the workbench, to check the bit of the iron is effectively earthed, and the hands too (this latter by being sure the wrists are earth, either on the plate directly or by using "fetters" on the wrists, the chains of which are connected to the brass plate and earth) and to use a conductive material to cover one's seat are just a few of the precautions, not to mention nylon clothing which is verboten; all this won't stop you from popping something, not to mention nylon clothing. Op-amps (operational amplifiers in general) are just gain blocks; the special type generally are a bit quicker than older ones.

When one comes to the linear IC's, we have a major collection to play with. Op-amps (operational amplifiers if you are pedantic) are just gain blocks; the special types intended for consumer or communications use are a law unto themselves; and the third category is that of power-supply regulation. This latter is a boon, in that one can provide each of several printed circuits with its own voltage regulator—which of course effectively gets all the surges which inevitably occur with logic which is "clocked" off the main wiring by restricting the surges to the board concerned.

Conclusions

So, you've got a bit of equipment which has "gone up the spout." You have taken the circuit diagram and traced out and located your fault to a particular item. It is hoped that the foregoing few words will enable you to look into your boxes of bits and to decide if there is anything suitable, or whether you have to go out and buy something. For the budding home-constructor with an article in the Magazine which he wants to build, we hope this will lead him away from the pitfalls of rash substitution—but any home-brew equipment which is a non-goer when first switched on is almost certainly fitted with a wiring error, so check this before you curse the components!

ANOTHER TIME-OUT
INDICATOR SELF-CONTAINED

H. ALLISON, G3XSE

The proliferation of repeaters, and the consequent short overs, plus the risk and inconvenience in observing the second hand of one's watch while driving, resulted in a unit being designed to give an indication of impending time-out and so preventing the writer "nattering-on" without benefit of a listener.

Many time-out indicators have appeared in the literature, mostly based on the ubiquitous NE555 IC. Though fine for their particular applications, they require modification to existing transceivers, and, by reason of their size are generally of no use with /Portable equipment. The design here presented not only overcomes this, but has the advantage of being transferable from car to car or even (Heaven Forbid!) used in the home station. Another feature of this design is that it is a "hands-off" instrument; in other words no action is required by the operator to use the gadget—it doesn't even sport an on/off switch!

Circuit Description

Refer to Fig. 1. A 19-inch length of wire acts as a quarter-wave aerial on Two Metres, and a degree of selectivity is also obtained by the tuned circuit L1, C1. CR1 is a germanium diode used to rectify the received carrier signal; the RF is decoupled by C2 and the remaining DC is fed, via a limiting resistor R1 to the base of TR1. This is a high-gain "darlington" transistor and is used to give reasonable sensitivity for portable work—with the normal ten-watt mobile transmitter, almost any npn transistor will serve.

The collector load of TR1 consists of a LED (Light Emitting Diode) and its associated series limiting resistor R2. The DC already mentioned as appearing at the base of TR1 turns it on and so causes the lamp to light when a carrier appears; and TR1 collector is also strapped to ML1A, one gate of a CD4001 used as an inverter. The output of this gate charges C3 via R3 and R4 to give an approximate delay of 55 seconds; CR2 provides a discharge path for C3 through the output end of ML1A.
The output from ML1A and the timing circuit appears at the input to ML1B, which serves both to again invert and, possibly more important still, to “clean-up” the delay output.

ML1C and ML1D are connected as a conventional CMOS oscillator, and are “switched on” by the operation of ML1B just discussed. To work as an oscillator, ML1C and ML1D must be biased in to the linear part of their characteristic; CMOS only draws significant current when it is in this area, and so CR3 is so connected as to bias the oscillator hard into a logic “1” state while the front-end is not receiving a carrier. The oscillator output is connected, via a limiting resistor R7 to the base of TR2, which may be any npn transistor man enough to drive T1 and yield a squawk out of the loudspeaker. T1 and LS1 are as easily found by cannibalising a cheap Japanese transistor radio as by any other source.

Construction
This has been constructed in umpteen ways, all different; but one precaution to be insisted on is to use an IC socket for ML1; remember it is a CMOS device, and put it in place last of all. “Dead-bug” construction techniques can be relied on to produce dead CMOS bugs! The first prototype was built up on a 14″ x 2½″ Lectrokit board, and housed in one of the mid-sized diecast boxed, complete with speaker and PP7 battery. By careful construction and the use of a PP3 battery, the whole issue can be persuaded to go into the small diecast box size.

Alignment
Commence by connecting a testmeter such as an AVO Model 8 in series with the battery; it should show less than five microamps. Remove the meter and connect normally, injecting a two-metre signal either by signal generator, GDO or by turning on the station transmitter; the LED should now light, and C1 may now be trimmed for best sensitivity, either by turning the generator down or walking away from the rig as the case may be, all the time tuning C1 for the lamp-on state.

After a period of continuous carrier indicated by the lamp being alight, a tone should be heard emanating from the ‘speaker; the delay between the reception of the carrier and the onset of tone can be set to the desired length by adjustment of R4. It should be noted that the time period depends on the leakage resistance of CR2 and C3 and the input impedance of ML1B; thus if the desired timing cannot be obtained, the time constant may be altered by changing R3 as desired.

Operation
Shove it on the back shelf, or the back seat, in the car and just forget about it! The low battery consumption makes an on-off switch quite unnecessary. When the box makes its noise, then it’s time to go to receive.

Variations on the Theme
Some people will regard the current drawn by the LED as being a bit much; if you are one of these, then dispense with the LED and connect a 470k resistor as the collector load to TR1 to reduce the current during the “count-up” cycle.

An untuned RF Choke will give broadband coverage; or the tuned circuit can be altered to give coverage of 432 MHz. If you use the wide-band variation, be careful about parking too near to cars with commercial gear aboard (public services, for example) lest you be interrupted by a tone which you can’t shut off!
SIMPLE BATTERY-CONDITION INDICATOR FOR /M

SIMPLE — RELIABLE AND FAILSAFE

This circuit is useful on any car, but all the more so if one is fitted with anything at all QRO in the way of mobile gear. It also, as a matter of interest, shows up the conflict between the "analogue" type of indication, and the modern "digital" approach which is often used purely to be modern and with-it, completely neglecting the strong points of either method.

Basically, one may say that where a user—the pilot of an air-liner, say—requires to monitor umpteen different parameters at a glance, looking for a change, then analogue indications such as ordinary panel-meter, are the right thing. The pilot knows from experience how each meter-needle should lie on its dial, and a change in one out of, say, forty dials is noted at each sweeping glance. Were these forty meters all made digital, then he would have to have a tame meter-reader at work, and even then it is unlikely that he would note a change in one reading. On the other hand, a digital indication is the obvious answer for, say, a calculator (comp.a with a slide-rule!), or a depth-sounder aboard a boat, where the object of the exercise is to have a clear statement of a numerical answer up-dated regularly. In such a case, a meter is clearly quite inferior to a digital display.

Our requirement here is for some means of indicating the state of the battery on the car; one which will fail safe—that is, no indication implies the presence of a possible fault, either in the car of the indicator; it must not distract the driver; and it must supplement any indication already aboard, such as the ignition warning-lamp on the dash, the ammeter, or whatever.

This simple circuit, containing as it does only three components (and one of those doesn't appear on the circuit) meets all these requirements, and in addition, if the work is carried out neatly, will not disfigure the family carriage in the way that, say, a bolt-on instrument panel does. Additionally, the co.t is minimal—a few coppers almost.

Now, to the mode of operation, and here we have to say, firstly, that the lamp-holder in which the bulb is fitted must have a green jewel if the thing is to work properly! In fact this is the third component and a vital part of the system. Consider your car's battery. Normally while running, the battery voltage will sit around 13.5 volts; above 14.5 says the charging system is going berserk, while a voltage of 13 or under indicates that the dynamo or alternator is not holding the battery voltage up, possibly due to excess load, or a slipping fan-belt of whatever. With these thoughts in mind we may turn to Fig. 1. Some "circuit" you will remark!

Now, the twelve-volt Zener diode voltage is, effectively, blocking twelve volts off from the lamp, which therefore sees the battery voltage less twelve volts.

Thus, the lamp will approach full brilliance only if the terminal volts rise far higher than they should, saying the battery is being grossly over-charged. If the battery is full, and being charged normally, the lamp will be just aglow; and if the battery volts fall, either due to excess load or lack of charge, the lamp will just go out. In other words, if the bulb fails, you suspect a fault, just the same as if it goes out due to lack of voltage.

Now, this is where we have to consider the question of the green lamp-holder jewel (most likely a plastic "jewel" these days!). Well now, consider what the green jewel does; it stops light of other than "green" wavelength and passes, to a large extent, only light of green. Now, our little lamp will give out mostly red wavelengths when it is only just aglow, and will only emit a sizeable amount of green when the bulb is getting quite bright. Thus, not only have we "suppressed the zero" of our analogue to the tune of twelve volts with the zener, but also we have fitted the bulb into a holder which adds maybe another volt of suppression just by its colour! And, this is just about right; the lamp under normal conditions is not bright enough to disturb by night nor is it quite invisible by day; thus, by day or night your little glim on the dashboard is telling you you can safely carry on mobiling; and if a fault situation develops, it gives you advance warning. For example, if the lamp goes out while you are on full load but comes up again when you go to receive, you know you are "pushing it a bit" and a glance at the ammeter will tell you whether the charge rate has gone up to compensate; if not, but there is at least a mite of, or zero, charge on the ammeter, then QRT and press on—your lamp will give you lots of warning if the battery falls any further. On the other hand, if the lamp comes up abnormally bright while on a run, you can be sure that you are overcharging the battery, and your ammeter will confirm this high charge rate while the lamp is saying the charge rate should have been cut down by the regulator.

**Fig.1 Battery condition indicator**

ZD1 is a twelve-volt zener diode, which may conveniently be a BZY 88 or similar type, while ILP1 is a five-volt, forty-milliamp lamp bulb, fitted in to a green-glass lamp-holder. It should be noted that one end of the circuit will be at chassis potential; generally the positive with older cars, and the negative end with the more modern types. Thus, in the writer's Rover 100, the positive end is connected to a convenient chassis earth behind the dash, while the negative end is joined to the twelve-volt rail where it leaves the ignition switch so that switching off the ignition disconnects the indicator.

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<tr>
<th>Frequency</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>144-030</td>
<td>4 MHz/TX-HC25U</td>
</tr>
<tr>
<td>144-9050</td>
<td>5 MHz/TX-HC25U</td>
</tr>
<tr>
<td>144-9050</td>
<td>6 MHz/TX-HC25U</td>
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<td>144-9050</td>
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</tr>
<tr>
<td>144-9050</td>
<td>8 MHz/TX-HC25U</td>
</tr>
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<td>144-9050</td>
<td>9 MHz/TX-HC25U</td>
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Wanted: Trio TX-599, good price paid.—Napper, 22 Rydal Drive, Hale Barns, Cheshire. (Tel: 061-9804252).

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